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- I. Infantry (Regular Army).**
Jan. 1924. 6d. Amendment
No. 1. March 1928. 1d.;
No. 2. May 1928. 1d.; No. 3. July 1928. 1d.; No. 4. Sept. 1928. 1d.; No. 5. Nov. 1928. 1d.; No. 6. Jan. 1929. 1d.; No. 7. March 1929. 1d.; No. 8. June 1929. 1d.; No. 9. Aug. 1929. 1d.
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- III. Army Service Corps (Regular Army).** 1913. (Reprinted, with Amendments published in A.O. up to Dec. 31, 1915. 6d. Amendment No. 1. March 1928. 1d.; No. 2. Jan. 1929. 1d.; No. 3. March 1928. 1d.
- IV. Iva, IVb, IVc and IVd. R.A. Ordnance Corps; R.A. Pay Corps; R.A. Veterinary Corps; Corps of Military Accountants; Army Educational Corps.** June 1923. 2d. Amendment No. 1. March 1928. 1d.; Amendment No. 1. Nov. 1928. 1d.; No. 2. Jan. 1929. 1d.; No. 3. June 1929. 1d.
- V. Royal Army Medical Corps (Regular Army).** 1928. 2d.
- VI—IX. R.M. Academy; R.M. and Staff Colleges; Garrison Staff**

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- and Schools of Instruction; Military Prisons, Detention Barracks and Military Provost Staff Corps (Regular Army). 1914. (*Out of print*)
- VI. Amendment** No. 1. July 1928. 1d.; No. 2. June 1929. 1d.
- VII. Amendment** No. 1. June 1928. 1d.
- VIII. Amendment** No. 1*. June 1928. 1d.
- IX. Amendment** No. 1. Nov. 1928. 1d.; No. 2. March 1929. 1d.; No. 3. Aug. 1929. 1d.
- Xa. Engineer, General, Fortress, Survey, Railway and Depot Units. Peace and War (Regular Army).** 1914. 2d. Amendments. No. 1*. Oct. 1927. 1d.; No. 2. March 1928. 1d.
- Engineer Details.** April 10, 1929. 6d. Amendment No. 1. June, 1929. 1d.; No. 2. Aug. 1929. 1d.
- Xb. Field Troop (Regular Army).** 1912. 2d.
- Xc. Divisional Engineers (Territorial Army)** 1929. 3d. Amendment No. 1. June 1929. 1d.
- Xd. Divisional Signal Company (Regular Army).** 1914. 2d.
- Xe. Signal Company (Wireless) (Regular Army).** 1913. 2d.
- Xf. Headquarters Signal Units (Regular Army).** 1914. 2d.
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- Xj. Signal Troop with Cavalry Brigade (Regular Army).** 1912. 2d.
- Xn. Field Squadron (Regular Army).** 1914. 2d.

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XIa. Horse Artillery with Q.F. 13-Pr. Equipment Brigade. Headquarters Battery Brigade Ammunition Column, with Amendments up to and including Dec. 1913. 1s. 6d. Amendments, June 1927. 3d.; No. 1*. Oct. 1927. 1d.; No. 2. Jan. 1928. 1d.; No. 3. March 1928. 1d.; No. 4. Sept. 1928. 1d.; No. 5. Nov. 1928. 1d.; No. 6. March 1929. 1d.; No. 7. June 1929. 1d.; No. 8. Aug. 1929. 1d.

XIb. Field Artillery with Q.F. 18-Pr. Equipment (Regular Army). 1926. 2s. 6d. Amendments, May 1927. 3d.; No. 1*. Oct. 1927. 1d.; No. 2. Jan. 1928. 1d.; No. 3. March 1928. 1d.; No. 4. June 1928. 1d.; No. 5. Sept. 1928. 1d.; No. 6. Jan. 1929. 1d.; No. 7. March 1929. 1d.; No. 8. June 1929. 1d.; No. 9. Aug. 1929. 1d.

XIc. Field Artillery, Q.F. 4.5-in. Howitzer (Regular Army). 1926. 1s. Amendments, June 1927. 1d.; No. 1*. Oct. 1927. 1d.; No. 2. Jan. 1928. 1d.; No. 3. March 1928. 1d.; No. 4. June 1928. 1d.; No. 5. Sept. 1928. 1d.; No. 6. Jan. 1929. 1d.; No. 7. March 1929. 1d.; No. 8. Aug. 1929. 1d.

XId. Reserve Brigades with Q.F. 18-Pr. Equipment, Horse and Field Artillery. Staff and Depôts. Riding Establishment, School of Gunnery (Horse and Field), and Mounted Band (Regular Army). 1914. 6d. Amendments No. 1*. Jan. 1928. 1d.

XIe. Pack Artillery with Q.F. 3.7-in. Howitzer Equipment

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(Regular Army). (1) Brigade Headquarters. (2) Battery 1927. 1s. 6d. Amendments No. 1*. Oct. 1927. 1d.; No. 2. Jan. 1928. 1d.; No. 3. March 1928. 1d.; No. 4. June 1928. 1d.; No. 5. Sept. 1928. 1d.; No. 6. Jan. 1929. 1d.; No. 7. March 1929. 1d.; No. 8. June 1929. 1d.; No. 9. Aug. 1929. 1d.

XIIa. Royal Garrison Artillery (Regular Army). 1914. 2s. 6d. Amendment, May 1927. 2d. No. 1*. Oct. 1927. 1d.; No. 2. Jan. 1928. 1d.; No. 3. March 1928. 1d.; No. 4. June 1928. 1d.; No. 5. July 1928. 1d.; No. 6. Sept. 1928. 1d.; No. 7. Nov. 1928. 1d.; No. 8. Jan. 1929. 1d.; No. 9. March 1929. 1d.; No. 10. June 1929. 1d.; No. 11. June 1929. 1d.; No. 12. Aug. 1929. 1d.

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XIV. Cavalry School, Netheravon (Regular Army). 1914. 2d.

XV. Camel Corps School, Egypt (Regular Army). 1914. 2d.

XVI. Special Reserve. 1913. 4d.

XVII. Officers Training Corps. 1912. 3d. Amendment No. 1. Jan. 1928. 1d.; No. 2. June 1928. 1d.; No. 3. March 1929. 1d.

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XVII. 1929. Amendment No. 1. June 1929. 1d.; No. 2. Aug. 1929. 1d.

Practice Batteries and Drill Guns (Fixed Mountings) of the Royal Garrison Artillery (Part 2, Sections XIIa and XVI, and Part 3). 1909. 1s. 6d.

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Amendments to Part 3, Section X. No. 1. July 1928. 1d.

Amendments to Part 3, Section IX. No. 2. Aug. 1929. 1d.

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HANDBOOK

FOR THE

303-IN. VICKERS MACHINE GUN AND TRIPOD MOUNTING, MARK IV.

1930



LONDON:

PUBLISHED BY HIS MAJESTY'S STATIONERY OFFICE

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Handbook for the 303-inch VICKERS MACHINE GUN.

CHAPTER I.

GENERAL INSTRUCTIONS.

1. *Hints for Instructors.*

1. Always inform the squad before beginning the lesson :—
 - i. The subject for instruction.
 - ii. The object of the lesson.
2. Make sure that every member of the squad fully understands the previous lesson before proceeding to the next.
3. Be brief and keep to the point. Do not dwell on non-essentials.
4. Talk to the squad, not to the gun.
5. Do not shout—talk loud enough for all the squad to hear.
6. Illustrate each point as you explain it. Do not try to explain anything that cannot be seen.
7. Always have the kit ready.
8. Take notes in writing as to the progress made in each subject by each member of the squad.
9. Make yourself acquainted each evening with the next day's work, and prepare your instruction carefully.

10. The success of a squad in mechanical work largely depends on the zeal and ability of the instructor.

11. The method of instruction will be based on the following sequence :—

- i. Demonstration.—The instructor should show exactly how the gun operates.
- ii. Explanation.—The instructor gives in a few words a description of what takes place.
- iii. Imitation.—The gunner under instruction tries to perform what he has just seen the instructor do except when mechanism is being taught.
- iv. Interrogation.—The instructor asks a few questions of those under instruction to see that they fully understand the lesson.

2. *Sequence of teaching.*

- (1) Name of gun.
- (2) Weight of gun, without and with water.
- (3) Forces working the gun.
- (4) Rate of fire.
- (5) Water-cooling system, belt feed, strong mechanism.
- (6) Steam and condenser.
- (7) How gun is fixed to tripod, elevating gear and traversing clamp.
- (8) Rigidity of gun and heaviness of mounting.
- (9) Show how to load, fire and unload.

Non-recoiling portions.

Barrel casing.

Exterior.

- (1) That it is made of steel.
- (2) Corrugations and reasons for these.

- (3) The outer casing of the muzzle attachment.
- (4) Gland and the screwed hole for packing.
- (5) End of the steam tube, and importance of the keeper screw.
- (6) Foresight, why set $\frac{5}{8}$ inch to the left of the axis of the bore; how fitted; how protected.
- (7) Steam escape hole—how closed; reason for the threads; how the threads are protected.
- (8) Emptying hole—how closed.
- (9) Filling hole—why set slightly to the right.
- (10) Barrel bearing.
- (11) Barrel rests.
- (12) Seating for ejection.
- (13) Crosshead bracket.

Interior.

- (1) Water capacity when filled.
- (2) When the water will boil, and the evaporation.
- (3) Interior tinned to prevent rust.
- (4) Gunmetal guide. The reason for it; how fixed.
- (5) Steam tube. Explain by diagrams (or remove if using a stripping gun).

Breech casing.

Riveted to barrel casing.

Exterior.—Right outside plate,

- (1) Cut away portion for the feed block.
- (2) Check lever—how fitted.
- (3) Slot for the crank bearings.
- (4) Slide for partially closing the slot.
- (5) Roller—how fitted.
- (6) Hole for the "T" fixing pin.

Left outside plate.

- (1) Studs for the fuzee spring box.
- (2) Fuzee spring box and spring. How the spring is attached to the adjusting screw and fuzee chain, and how the tension is altered.
- (3) Front cover catch.
- (4) Slot for crank bearings.
- (5) Slide for partially closing the slot.
- (6) Hole for the "T" fixing pin.
- (7) Elevating stop.

Bottom plate.

- (1) Bottom plate.
- (2) Sliding shutter.
- (3) Sliding shutter catch.
- (4) Elevating bracket.

Rear crosspiece.

- (1) How fixed and secured by the "T" fixing pin.
- (2) Handles, containing oil and brushes.
- (3) Safety catch.
- (4) Firing lever.

Front cover.

How secured by the hinge pin.

Rear cover.

- (1) How secured by the hinge pin.
- (2) Bridge for the tangent sight.
- (3) Tangent sight—how secured.
- (4) Graduated plate and keeper screw.
- (5) Slide and its components.
- (6) Rear cover lock.

Interior.—Front cover.

- (1) How the claws are engaged by the front cover catch.
- (2) Extractor stop and the reason for it.

Rear cover.

- (1) Cover lock spring.
- (2) Trigger bar.
- (3) Trigger bar spring.
- (4) Lock guides.
- (5) Ramps.
- (6) Reason for the grooves on the outer edges.

Right and left outside plates.—Cams ; steps.

Rear crosspiece.—Trigger bar lever—how actuated.

Bottom plate.—Nil.

Recoiling portions.

Muzzle cup.

Mark II.

Barrel.

- (1) Why browned.
- (2) Muzzle—screwed thread (Mark II).
- (3) Cannelure for asbestos packing.
- (4) Barrel block and trunnions.
- (5) Interior of barrel.

Right and left side plates, crank, &c.

- (1) Holes for the trunnions.
- (2) Lock guides and interruptions.
- (3) Crank bearings.
- (4) Side-plate springs.
- (5) Extension for prevention of dust, grit, &c.

- (6) Prolongation of the left side-plate.
- (7) Crank.
- (8) Crank handle.
- (9) Fuzee and chain.
- (10) Crankshaft.
- (11) Fuzee stem and lugs.
- (12) Connecting-rod.
- (13) Crank pin.
- (14) Interrupted flange.
- (15) Adjusting nut and washer.

Lock.

- (1) Side lever head, split pin and axis bush.
- (2) Side levers.
- (3) Extractor levers and extractor.
- (4) Tumbler axis pin.
- (5) Tumbler.
- (6) Trigger axis pin.
- (7) Trigger.
- (8) Lock spring.
- (9) Firing pin.
- (10) Sear and spring.
- (11) Lock casing.
- (12) Gib, gib spring and cover.

Feed block.

- (1) Slide and how worked by levers.
- (2) Top pawls and difference between them, with reason.
- (3) Top pawl spring.
- (4) How the top and bottom levers are connected.
- (5) Bottom lever and reason of stud.
- (6) Bottom pawls.
- (7) Bottom pawls spring.

- (8) Cartridge guides.
- (9) Cartridge and bullet stops.

Tripod, Mark IV.

- (1) Name and weight.
Mounting, tripod, .303-inch M.G. Mk. IV, 48 lb.; with dials, 52 lb.
- (2) Chief parts—
 - (a) Crosshead.
 - (b) Elevating gear.
 - (c) Socket.
 - (d) Legs.
- (3) Limits of elevation and depression.
- (4) All round traverse. Direction dial.

Crosshead.

- (1) Pivot to fit into the socket.
- (2) Arm which carries the elevating gear.

Elevating gear.

- (1) Worked by a graduated elevating wheel.
- (2) Inner and outer screws, right and left-handed.
- (3) Elevating nut and locking of same by tumbler nut.
- (4) Tumbler—how provided with a jamming bolt.
- (5) Chain connection to the crosshead.

Socket.

- (1) Bored to receive the pivot of the crosshead.
- (2) Three lugs to receive the legs.
- (3) Clamp screw for checking traverse, with handle and jamming block.

Legs.

- (1) Serrations to correspond with similar serrations on lugs.
- (2) Made of tubular steel, feet and joints solid.
- (3) Numbers placed on the leg joints.
- (4) Clutch plates and jamming handles.
- (5) Strap to secure legs during transport.*

Belts and boxes, belt.

Chest.—Vickers or Lewis, .303-inch M.G., Mk. II or Mk. III.

Sights.—Night, and foresight, bar, deflection.

Condenser.—Steam.

* Straps and inscription plates are now obsolescent.

CHAPTER II.

THE GUN.

3. Nomenclature of parts of gun.*

1. The following is the nomenclature of parts of the gun :—

Lock.—Consisting of casing ; side levers, axis bush and split keeper pin ; extractor levers right and left ; extractor ; gib ; gib spring and cover ; sear and spring ; trigger and axis pin ; tumbler and axis pin ; firing pin ; lock spring.†

Block, feed.—Consisting of body ‡ ; slide ; top and bottom levers and split fixing pin ; top and bottom pawls (front and rear), springs and axis pins.

Rear crosspiece.—Consisting of body ; T-fixing pin ; joint pin, check nut and keeper pin ; firing lever with pawl and axis pin ; trigger bar lever ; safety catch, axis pin, spring with piston ; milled heads with oil brushes and leather washers.

Box, fuze spring.—

Spring, fuze.—Including fittings.

Screw adjusting fuze spring.—Including vice pin.

Fuze.—With chain and fixing pin.

* For use as a guide to subsequent description only.

† Either No. 1 or 2.

‡ Supplied both in steel and gunmetal. The latter is painted.

Plate, side, right.—Including side plate spring.

Plate, side, left.—Including side plate spring.

Crank.—Including crank pin and fixing pin.

Rod, connecting.—Including adjusting nut and six washers ; three No. 1 ($\cdot 003$ -inch) ; three No. 2 ($\cdot 005$ -inch).

Handle, crank.—Including fixing pin.

Barrel.—With asbestos packing.

Sight, tangent.—Consisting of stem ; graduated plate and upper and lower fixing screws ; slide with aperture pillar * ; pinion ; clamping nut and split pin ; jib spring and washer † ; clamping screw and fixing pin ; tangent sight spring and piston.

Cover, rear.—Consisting of cover ; cover lock, axis pin and spring ; trigger bar and spring ; cover joint pin with check nut and keeper pin.

Cover, front.

Casing, barrel.—Consisting of casing ; steam tube with slide valve and keeper screw ; packing gland ‡ ; asbestos packing ; two screwed plugs each with link, S-hook and stud ; adapter for condenser § ; cork plug, with chain and two S-hooks.

Sight, fore.

Casing, breech.—Consisting of casing ; check lever

* Mk. II * and II ** slides.

† Mk. II ** slide.

‡ This is kept in the spare parts box for use in emergency.

§ Where the earlier pattern of condenser tube is fitted the protector condenser boss occupies the location of the adapter.

and keeper pin; sliding shutter with catch, keeper pin, spring and plunger; left slide; right slide with roller, collar and split fixing pin; front cover catch, keeper pin, plunger, plug and spring.

Muzzle attachment for ball-firing.—Consisting of outer casing, with split keeper pin, chain, S-hook and stud; disc; front cone*; muzzle cup and gland.

N.B.—Breech and barrel casings are riveted together and cannot be separated.

4. *System of instruction to be followed.*

The general description to be given to the 1st year man will be as follows:—He will not be expected to learn the names of all the parts at once, but will learn them during his lessons in stripping, immediate action, etc.

Name.—303-inch Vickers machine gun.

Weights.—Weight of gun, $28\frac{1}{2}$ lb. (including muzzle attachment, weighing about 1 lb.), $38\frac{1}{2}$ lb. with water in casing. Guns of later manufacture, in which a number of the refinements for the sake of lightness are omitted, are about 4 lb. heavier.

The gun is worked by two forces.

- i. The explosion of the charge.
- ii. A spring called the fuze spring.

Rate of fire.—The gun fires normally at the rate of about 500 rounds a minute.

* There are two patterns of front cone—Marks I and II. The Mark II has a conical front and is bullet-proof. Either pattern may be issued.

Water-cooling system, belt feed and strong mechanism allow of sustained fire.

Steam is overcome by use of condenser and condenser tube.

Show how gun is fixed to tripod and show elevating gear and traversing clamp.

Explain how fire can be rapidly directed on to any target.

Show rigidity of gun and heaviness of mounting giving accurate long range fire up to the limit of the sights, and indirect, overhead and night fire.

Compare with Lewis gun.

Show how to load, fire and unload.

5. *Description of non-recoiling portions.*

Barrel casing.—*Exterior.*—The barrel casing is of steel, with longitudinal corrugations for strengthening purposes.*

On the front end of the barrel casing is fitted the muzzle attachment. The outer casing of the muzzle attachment is a hollow cylinder screwed internally at the front end to receive the front cone. It is bored and grooved at the rear end to form an inner flange interrupted for connection with the gland, which has an outer flange correspondingly interrupted to engage with it.

Vent openings for the escape of gases are cut near the front end of the casing.

A split pin is attached to the outer casing by means of a chain connection. The pin can be entered in any one of three holes bored at equal distances in the outer casing for

* Uncorrugated casings will also be met with; these are made of thicker material to give the same strength.

engagement with any one of three corresponding holes in the gland.

The disc is pressed home on the front cone before the latter is screwed into the outer casing.

A Mark II front cone has been introduced. This is bullet-proof. Unlike the Mark I, it is conical at the front, in order that if it is struck by bullets the latter may glance off again.

To prevent the escape of water there is at the forward end of the barrel casing asbestos packing, which is held in position round the barrel by the packing gland.

The gland is screwed into the packing gland seating at the front end of the barrel casing and acts as a front bearing for the barrel.

The gland and front cone have flanges which are grooved to receive the combination tool provided for assembling and stripping purposes.

Above the gland is the screwed head of the steam tube. It is retained in position by a keeper screw.

On top of the barrel casing is the foresight. It is $\frac{5}{8}$ inch to the left of the axis of the barrel in order to make the lines of sight and fire parallel. It is protected by side wings, formed on the block fixed to the barrel casing, into which the foresight is dovetailed. There is an opening in the right wing, through which the foresight is assembled, and a punch hole in the left wing for adjusting and removing.

A cork plug is provided, which is inserted in the steam escape hole when the gun is travelling, in order to prevent waste of water.

The cork plug fits into a special fitting made to receive a condenser tube. This fitting is provided with a protector

to be used when the condenser tube is not connected with the gun.*

On the underside of the barrel casing is a hole for drawing off the water. It is closed by a screwed plug.

On top of the barrel casing is a hole for filling the barrel casing with water. It is closed by a screwed plug. The hole is placed slightly to the side of the barrel casing in order to prevent the barrel casing from being completely filled, which might lead to damage during frosty weather, and also in order to prevent the steam tube from being fouled by the filler.

At the rear end of the barrel casing is a sleeve, through which the barrel passes on being assembled. The barrel bearing is at this rear end of the barrel casing.

When the gun is assembled, the front of the barrel block bears against the face of the barrel bearing. At the rear end of the casing are the barrel rests, to give support to the barrel through the side-plates.

There is a seating for ejection on the bottom of the barrel casing, which ensures the empty case being knocked off the extractor should it fail to drop off before the extractor is in a position to rise.

Under the rear end of the casing is a bracket to take the cross-head joint pin, which secures the gun to the mounting.

Barrel casing.—Interior.—The barrel casing holds about 7 pints of water.

The water commences to boil after about 600 rounds have been fired continuously. It evaporates at the rate of about $1\frac{1}{2}$ pints a 1,000 rounds, and approximately

* For the latest pattern of condenser an adapter replaces the protector, and is a permanent fixture to the gun.

2,000 rounds may be fired continuously before the barrel casing requires refilling.

The inside of the barrel casing is tinned to prevent rust.

The front end of the barrel casing contains a gunmetal guide, to lead the barrel through the front of the barrel casing when the barrel is being replaced after stripping. It forms a bearing for the barrel, and at the same time a seating for the asbestos packing.

Guns of later manufacture have, leading up to this guide and extending rearwards, a brass trough, which fits into the bottom central corrugation of the casing, being riveted to the casing at each end of the corrugation. A few guns have a short trough at the front end only. The object of the trough is to facilitate assembling, and to prevent the tinned surface of the casing from being scratched off by the muzzle of the barrel.

The steam tube, which is of brass, consists of a fixed tube and an outer tube (termed the slide valve), so arranged as to slide freely along the fixed tube. In the fixed tube there is a hole near each end, and in the threaded portion in front a third hole, which connects with the steam escape hole by a tube attached to the interior of the barrel casing. The steam tube is screwed into the front end of the barrel casing, and is retained in position by a keeper screw, which ensures the third hole being connected with the steam escape hole. At the breech end it fits into a thimble fixed to the rear end of the barrel casing.

If the gun is fired with elevation, the valve slides backwards and, closing up the hole at the rear end of the tube, prevents the water from entering. At the same time the front hole is left uncovered, and, being above the water

level, allows the steam to enter the tube and escape through the steam escape hole in the barrel casing. Similarly, if the gun is fired with depression, the valve slides forward, and allows the steam (but not the water) to escape through the rear hole. When the gun is horizontal either one or both holes are uncovered by the valve.

Breech casing.—Exterior.—The breech casing which is riveted to the barrel casing consists of:—

- (1) Two outside plates (right and left).
- (2) A bottom plate.
- (3) Two covers (front and rear).
- (4) The rear cross-piece.

Right outside plate.—It is cut away to enable the feed block to be inserted in the gun. The left outside plate is similarly cut away.

To the outside of the right plate is riveted the check lever bracket, on the outside stud of which the check lever pivots. There are two patterns of brackets, Mark I and Mark II. The Mark I bracket is grooved on the inside face to fit over the rib on the lightened pattern of plate, whilst on the Mark II two studs are formed for engagement in holes bored in the unlightened plate. A few brackets of the Mark II pattern have only one stud; these have not proved very satisfactory, some having been found to work loose. Such should be replaced where necessary by the later pattern, which requires fitting by an armourer or artificer, in accordance with para. 17,743, L. of C. The early pattern of Mark I bracket has a second stud on the outside, which was provided as a bearing for a check lever piston with spring.* In

* Earlier Mark I pattern check levers were fitted with a piston and spring now obsolescent. A Mark II pattern is now supplied. This is longer and heavier at its upper end.

brackets of later manufacture this second stud is omitted. The check lever is secured to the outer stud by a keeper pin, the stud being grooved for the pin, necessary clearance being allowed for the movement of the check lever and pin.

A slot is cut at the rear end of the right outside plate in which the crank bearings slide.

The slot is partially closed by a slide which carries a roller.

The roller is kept in position by a collar and split pin.

At the rear end of the right outside plate is a hole through which the threaded end of the "T" fixing pin passes.

Left outside plate.—On the outside of the left plate are two studs for holding the front end of the fuzee spring box; a third stud for holding the rear end of the fuzee spring box is fitted on the slide.

The fuzee spring box contains a strong spiral spring called the fuzee spring, the rear end of which is connected by the fuzee chain and fuzee with the crank. The front end is attached to the breech casing by means of the fuzee spring box and adjusting screw, which passes through the front end of the fuzee spring box, and through the nut at the front end of the spring.

The fuzee spring can be adjusted without removing the box, as the vice pin of the screw is loose. This screw is kept in position by two nibs which enter recesses in the front end of the fuzee spring box and are retained by the tension of the fuzee spring.

On the left outside plate is the front cover catch for securing the front cover.

This catch must be turned up in order that the cover

may be opened. The catch, when down, is kept in position by a plunger, plug and spring.

A slot is cut at the rear end of the left outside plate in which the crank bearings slide.

The slot is partially closed by a slide which carries a stud.

The rear end has a hole to allow the "T" fixing pin to be inserted.

Underneath the left outside plate is the elevating stop. Without this it is possible for the crosshead of the mounting to damage the fuzee spring box.

Bottom plate.—There is an opening in the bottom plate through which the empty cartridge cases fall to the ground. This opening has a sliding shutter, which, when shut, prevents dirt, &c., from entering the gun. The shutter must be moved to the rear before the gun can be loaded. If the shutter is closed after loading, only one shot can be fired; but the empty case will remain in the breech casing, and another cartridge will be fed up; the extractor dropping on to the shutter will prevent the lock from going forward. The shutter is secured by a catch, with thumb-piece, plunger and spring.

Under the bottom plate is the elevating bracket, to take the elevating joint pin, which secures the gun to the elevating gear.

Rear crosspiece.—The outside plates are connected at the rear end by the rear crosspiece, which is hinged at the bottom by a screwed joint pin and fixed at the top by the "T" fixing pin. The rear crosspiece is fitted with handles of wood, inside which are steel cylinders for carrying oil, closed by milled heads fitted with a brush

and leather washer, firing lever with thumb-piece and pawl, safety catch, and safety catch piston and spring.

Front and rear covers.—The two covers are both hinged on one joint pin attached to the outside plates just behind the feed block. The pin is secured by a check nut with a keeper pin.

The joint also forms a tie for the outside plates.

On top of the rear cover is the tangent sight, which is positioned by a piston and spring. The sight, when down, rests on a bridge, which is solid with the rear cover and strengthens it.

The *tangent sight* consists of a stem, a plate graduated up to 2,900 yards, and a slide.

The tangent sight stem is provided with a fixed aperture sight, the aperture being bored in a semi-circular flange formed on the left of the stem at the rear end. It is sighted for a range of 400 yards, and is for use when the stem is horizontal. A rack for engagement by the pinion of the slide is cut along the face of the stem on the right. The graduated plate is secured on the left of the face by upper and lower fixing screws.

The Mk. II slide is divided into two parts by a longitudinal saw cut. The two parts, having the pinion wheel pivoted between them, can be clamped to the stem by means of a clamping nut on the right in order to fix the slide in the desired position and to prevent it from being jarred down during firing.

The sighting U is formed in a blade which projects on the left of the left part of the slide.

The pinion is provided for the purposes of finally positioning the slide after the latter has been moved into the approximate position desired. The Mk. II * slide

differs from the Mk. II†, in that an aperture pillar is fitted to the blade to replace the U sighting, a large semi-circular opening being cut in the position of the original U in order to expose the whole of the sighting portion of the pillar. The Mk. II** differs from the Mk. II* in that the right-hand portion is fitted with a friction spring to improve the grip on the stem, a spacing washer is fitted between the pinion and the same portion, and the clamping nut, designated No. 2 is fitted with a thumb-piece.

The rear cover lock has to be lifted in order to raise the rear cover.

Breech casing.—Interior.—Front and rear covers.—The front cover has two claws, which are engaged by the stem of the front cover catch. It also has an extractor stop, which acts in conjunction with the extractor stop on the lock casing, in order to prevent the extractor from rising too high.

On the inside of the rear cover is the cover lock spring which actuates the rear cover lock.

The trigger bar slides inside the rear cover. This has a lug on the right, against which the trigger bar spring bears, and a projection on its rear end which engages the head of the trigger bar lever. In its front is a slot in which slides the tail of the trigger when the lock is moving backwards and forwards.

The front end of the slot engages the tail of the trigger and draws it back when the trigger bar is drawn to the rear by pressure on the thumb-piece. The trigger bar is kept in position by means of projections on the lock guides on the rear cover.

† The Mk. II and II* slides are obsolescent.

There are two ramps fixed inside the rear cover, which force the extractor down on recoil.

The rear cover and crosspiece are grooved to fit over the edges of the breech casing, so that when the "T" fixing pin is home and the cover is locked, these, with the assistance of the screwed cover joint pin, keep the casing and cover rigid.

Right and left outside plates.—On the inside of both plates are cams, which control the path of the extractor. These cams have a step cut in each on the rear sloping surface. These steps are for the purpose of preventing the lock from going forward if, owing to insufficient recoil, the recoiling portions do not come back far enough to allow the extractor to drop. They are also the means of hanging the lock.

Rear crosspiece.—Inside the rear crosspiece is the trigger bar lever, which, pivoting on the "T" fixing pin, draws back the trigger bar.

The trigger bar lever is actuated by pressure on the thumb-piece and returned to its rest position by the safety catch spring when pressure is released.

6. Description of recoiling portions.

Muzzle cup.—The muzzle cup is bored and threaded at the rear end to screw on to the end of the barrel.

Barrel.—At the rear end of the barrel there is a cannellure, filled with asbestos packing, which prevents the escape of water. At the breech end it is formed with a square block, from which project two studs (one at each side), called the barrel trunnions. By means of these trunnions the barrel is connected to the side-plates.

The front of the barrel block bears against the face of the barrel bearing in the barrel casing.

The interior of the barrel is rifled, and has five grooves and lands with a left-handed twist.

In front of the cartridge chamber is the lead, which forms a funnel to guide the bullet into the rifling. The bore, rifling, and chamber are the same as in the barrel of the service rifle.

Side-plates.—The side-plates are both bored to receive the barrel trunnions, and have guides along which the flanges of the lock move. These guides have two interruptions on each side, to enable the lock to be lifted out. In addition, each side-plate has a bearing through which the crank passes, thus connecting the latter with the barrel. These bearings move in slots in the breech casing.

Both side-plates are fitted with side-plate springs, to ensure that the horns of the extractor do not drop below the solid cams during the backward movement of the lock, when there are no cartridges on the extractor.

There are extensions for the exclusion of dust, grit, &c., at the rear end of both side-plates.

The left side-plate is prolonged to the front, and has a recess in which the stud of the bottom lever of the feed block engages.

Crank.—The crank is fitted with a connecting rod, which is free to rotate on the crank pin. Outside the breech casing on the right it has a curved handle, the upper surface of which bears on the roller when the gun is firing. On the left it is fitted with a fuzee, to which is attached a chain of two links, by means of which it is connected to the fuzee spring. The fuzee is attached to

the crankshaft by means of a stem and lugs, and is easily removed.

Connecting-rod.—The connecting-rod is attached to the crank by means of an axis pin called the crank pin, and is arranged to take the lock by means of an interrupted flange, thereby connecting the crank and lock. It has an adjusting nut, and washers are provided which enable its length to be increased. By this means the space between the extractor and the barrel can be adjusted, thus preventing separations.

The lock.—The lock is attached to the connecting-rod by the side lever head, and when in the firing position closes the breech. In this position it is held by the side levers, the crank (fixed in bearings in the side-plates) and the connecting-rod. The connecting-rod and side lever head are slightly below the horizontal to prevent the breech from being opened at the moment of firing. The lock has a reciprocating motion communicated to it by the rotation of the crank, and is kept in position during its backward and forward movements by means of flanges working along guides on the side-plates, and by the guides on the underside of the rear cover.

The lock casing has a piece riveted inside at the top of the front face which acts as a guide for the lock spring when the lock is being assembled, and also forms a seating for the spring. Its sides are drilled for the various axis pins, and on its underside it has flanges which work on the guides on the side-plates. The lower of these flanges has interrupted portions to agree with those in the guides and allow the lock to be removed from the gun.

The lock casing contains the firing pin, the tumbler and

axis pin, the trigger and axis pin, the sear and spring and the lock-spring.

The extractor is attached to the front end of the lock by guide ribs, upon which it slides, and contains the gib, the gib spring and cover.

The projections on the gib, together with the cartridge grooves, form recesses which retain the cartridge in position.

The extractor is moved upwards by means of the side and extractor levers. The upward and downward movements of the extractor are regulated by guide ribs and stops, the top stop on the face of the lock casing, acting in conjunction with the stop on the underside of the front cover, limits the upward travel of the extractor, while the bottom stops formed on the sides of the lock casing limit its downward travel; the extractor levers bear on them.

Feed block.—The feed block is of steel (or gunmetal) and fits under the front cover into a recess cut in the breech casing. It is provided with a slide, to which are attached two pawls with spring for the purpose of moving the cartridges from right to left. These pawls are made with finger-pieces which can be pressed down together to release the pawls from the belt. The slide has a transverse motion given to it by means of two levers which are fitted together. The top lever has a stud which engages a slot on the slide, and on the bottom lever is a stud which engages in the recess in the prolongation of the left side-plate. By this means the slide is connected with the recoiling portions. The feed block has also two stationary bottom pawls (actuated by a spring), which are connected by a finger-piece, and which engage under

the next cartridge and prevent the belt from slipping backwards during firing. The feed block is provided with guides fitted above and below in the cartridge way which ensure the cartridges coming to the exact position where they can be gripped by the extractor. The cartridges are prevented from being pushed too far through to the left by means of the cartridge and bullet stops, which are inside the feed block.

CHAPTER III.

MOUNTING, TRIPOD, '303-INCH M.G. MARK IV.

(Plates X and XI.)

7. General description.

The mounting consists principally of a crosshead (*a*), elevating gear (*b*), and socket (*c*), mounted on three legs.

It is constructed to give 13 degrees elevation and 25 degrees depression at heights varying from 14½ inches * to 30 inches from the axis of the gun to the ground. By arranging the position of the rear and front legs respectively, elevation may be given up to about 43 degrees and depression to 55 degrees. An all round traverse can be obtained.

The crosshead (*a*), to which the gun is pivoted, is formed with a pivot to fit into the socket (*c*) and an arm (*d*) which carries the elevating gear (*b*).

In cases where it is found that, owing to the position of the web of the crosshead, the gun cannot be brought down so that the stop on the gun will rest on the web without bringing the fuze spring box of the gun in contact with the curved arm of a crosshead, a stop piece will be riveted to the front of the internal crossweb by an armourer or an artificer in accordance with the drawing in para. 17,289, L. of C.

* See Plate XI.

The elevating gear, which is actuated by an elevating wheel (x), consists of an inner and outer screw (right and left-handed) and a nut working within a tumbler (g). The tumbler is split and provided with a jamming bolt (h), by which the wear may be taken up. A chain secures the inner screw to the crosshead to prevent loss while travelling.

The socket (c) is bored to receive the crosshead and is provided with three lugs (n), to which the legs are hinged; a jamming block and screw with handle (f) is attached to the front to secure the crosshead in any desired angle of traverse; the block works in a recess in the upper portion of the crosshead and prevents it from rising. Both faces of the rear lug and one face of each front lug are fitted with clutch plates having radial serrations to correspond with similar serrations on the faces of the leg joints. Joint studs with disc spring and jamming handle (s) are fixed to the front lugs, by which the legs are securely clamped to the socket in the required position.

The legs (j, k) are of tubular steel, the lower ends being fitted with shoes (m) to steady the mounting on the ground, and the upper ends having a joint with radial serrations mentioned above. The rear leg is provided with a joint pin with nut and jamming handle (i).

On a portion of the periphery of the leg joints numbers are stamped at regular intervals, so that, when read in conjunction with a zero mark, the relative position of the legs to their normal position may be readily seen.

A strap is fixed to the rear leg to secure the three legs during transport.*

* This strap is obsolescent.

When firing, the ammunition box is placed on the ground on the right side of the gun.

Weight of mounting ... about 56 lb.

8. General notes on care and adjustment.

The following notes are drawn up as a guide to officers and others for the detection of faults in the Mark IV mounting.

Short instructions are given as to how these various faults can be put right, and the proper person qualified to carry out such repairs and adjustments as may be required.

Inaccuracy in shooting can, in nearly every case, be attributed to the mounting and not to the gun.

Although play or wear in any one particular part of the mounting may be so slight as to be almost negligible, yet there are so many places where play can originate, that the effect of it becomes cumulative, and can cause serious unsteadiness in the gun. All errors due to play in joint pins and elevating gear are gradual, and should be attended to when opportunity occurs.

The mountings must be overhauled by an armourer every quarter, or more often as necessary, properly cleaned, re-oiled or greased. All taper pins and fixing pins must be tight, all adjusting screws and nuts properly adjusted, and the mounting left in a properly lubricated and serviceable condition.

Defects or damage should be reported directly they are discovered, so that they may be remedied without delay.

One of the chief causes of unsteadiness in the gun can be found in the elevating gear, and before going into the details of where wear can take place, and the remedy

to be applied, it is first necessary to understand the construction of the mechanism.

9. Detailed description of elevating gear.

The nomenclature of the elevating gear is given here under together with the reference numbers to Plate IX

- | | |
|----------------------------------|-----------------------------|
| 1. Tumbler. | 8. Elevating wheel. |
| 2. Feathers tumbler. | 9. Nut, elevating wheel. |
| 3. Shoulder, „ | 10. Nut, elevating. |
| 4. Trunnions, „ | 11. Nut, tumbler. |
| 5. Bush elevating wheel. | 12. Screw, elevating outer. |
| 6. Collar, bush elevating wheel. | 13. Screw, elevating inner. |
| 7. Feather, elevating wheel. | 14. Pins, tumbler. |

Tumbler.—The tumbler is a manganese bronze casting. Commencing from the top it is threaded internally to a depth of about a quarter of an inch to take the tumbler nut.

It is then bored cylindrically for about two inches until a shoulder is reached, which reduces the diameter about one-eighth of an inch, and is continued down to the bottom of the tumbler.

The upper cylindrical portion is provided with two feathers which commence just below the screwed part, and these are continued downwards, stopping short about three-quarters of an inch from the shoulder.

These feathers are for the purpose of positioning the elevating nut and preventing its rotation.

The lower cylindrical portion is plain and of the same diameter as the bush which passes through it.

Externally, the tumbler is provided with two trunnions which are bored out to take the tumbler pins.

To the rear of the tumbler is a projection bored through to take the jamming bolt with nut and pointer. The rear of the tumbler is slit up from the bottom through the projection for two inches in order to allow the jamming bolt to operate.

Bush, elevating wheel.—The bush is of manganese bronze. Externally the upper portion is provided with a collar of the same diameter as the upper cylindrical portion of the tumbler, the part below the collar being of the same diameter as the lower cylindrical portion of the tumbler.

The collar is provided with two feather-ways which allow the bush to pass through the upper portion of the tumbler when stripping or assembling, the collar being seated against the shoulder in the tumbler.

The bush is now free to rotate, since the collar has passed below the feathers on the upper cylindrical portion of the tumbler, and the lower portion of the bush projects about one inch below the bottom of the tumbler.

Towards the bottom of the bush is to be found a slot to take the feather elevating wheel, and the bottom end of the bush is threaded to take the nut elevating wheel.

Internally the bush is bored out to the diameter of the outer screw to form a guide for the latter. It is also provided with two feathers running the whole length which engage the feather-ways on the outer screw.

Feather, elevating wheel.—This is a small piece of steel, machined to fit the slot cut in the lower end of the bush. The feather is provided with a small punch mark to indicate the side to be uppermost when assembling.

Elevating wheel.—The elevating wheel is made of manganese bronze. Its hub is bored out to the same

diameter as the bush over which it fits. It has a feather-way cut on the inside to enable it to pass over the feather, and by this means it becomes locked to the bush. The upper surface of the rim is graduated with degree and 10-minute grooves, and with centre punch impressions for each 5 minutes.

Nut, securing elevating wheel.—Consists of a manganese bronze ring threaded internally, to screw on to the lower end of the bush, thus preventing the elevating wheel from dropping off. The outer surface of this ring is provided with two holes, to allow of its adjustment by means of a punch or other suitable tool.

Nut, elevating.—This is a steel nut about one and three-quarters of an inch in length.

Externally, it is cylindrical, and turned to the same diameter as the upper cylindrical portion of the tumbler, and is provided with two feather-ways running the whole length of the nut. These feather-ways engage with the feathers on the inside of the tumbler.

Internally, the nut is provided with a double left-hand thread to take the outer screw.

When in position the lower end of the nut bears against the collar of the bush, and is retained in this position by means of the tumbler.

Nut, tumbler.—This nut consists of a manganese bronze ring. Externally, it is threaded to screw into the top of the tumbler; internally, it is bored out plain to the same diameter as the outer screw and allows the same to pass freely through.

The top side of the tumbler nut is provided with two holes to allow of adjustment by means of a punch or other suitable tool.

When in position this screw is screwed down tightly against the top of the elevating nut on which it bears, thus keeping the latter in position.

Screw, elevating, outer.—This screw is made of steel, and has a hole running throughout its length.

Externally, it is provided with a double left-hand thread to fit the elevating nut.

The lower end of this screw has a collar which acts as a stop to prevent its being screwed out of gear.

Throughout the whole length are two feather-ways which engage with the feathers on the inside of the bush when the screw is assembled.

Internally, the outer screw is provided with a double right-hand thread which extends from the top to midway, and through which the inner screw works. The lower half is drilled out to the full diameter of the inner screw, and is cylindrical and unthreaded.

Screw, elevating, inner.—The inner screw is also made of steel with a solid shank.

The upper portion is formed into a bearing to take the elevating joint pin.

The shank is threaded with a double right-hand thread which screws into the top of the outer screw.

Just below the bearing will be found a small hole drilled through the shank to take a split pin to which is attached the chain, securing joint pin, and chain, securing elevating gear. This attachment prevents the inner screw from becoming unscrewed, and consequent loss.

Bolt, jamming, with nut and pointer.—This is a half-inch steel bolt which passes through the holes provided in the rear projection of the tumbler, the elevating pointer

being gripped between the head of the bolt and the left side of the projection.

On the nut being tightened up it contracts the lower portion of the tumbler, and by this means the requisite amount of grip can be imparted to the elevating wheel.

Pins, tumbler.—These pins are made of steel and turned to two diameters, and provided with a flat head. They are positioned in two holes drilled through the extremities of the crosshead, and are secured in position by fixing pins.

The ends of their shanks project inwards, and are seated in the holes in the tumbler trunnions.

10. *Action of the elevating gear. (See plate IX.)*

On rotating the elevating wheel the movement is transmitted to the bush to which it is keyed by means of the feather.

The bush in its turn rotates the outer screw to which it is keyed, by means of the feathers on the inside of the bush being engaged in the feather-ways of the outer screw.

The outer screw, on being rotated, working in the elevating nut, rises or falls according to which direction the elevating wheel is rotated.

The inner screw, which works inside the outer screw, and is itself prevented from rotating by being attached to the gun, is therefore forced upwards or downwards according to which direction the elevating wheel is rotated, for the reason that the threads work in *opposite directions*.

If both threads of the inner and outer screws acted in the same direction it will be seen that as fast as the outer

screw was screwed up, it would climb up the inner screw, and there would be no movement transmitted to the gun.

11. *Stripping and assembling the elevating gear.*

Stripping the elevating gear should not be undertaken except for the purpose of repair, and then only by an armourer.

It is not advisable to remove the tumbler from the bracket, unless absolutely necessary, owing to difficulties connected with the fixing of the tumbler pins.

The sequence of operations for stripping is as follows :—

1. Disconnect split pin, securing chains and joint pin, from head of inner screw.
(Frequent removal of this pin soon results in its fracture.)
2. Unscrew inner screw.
3. Unscrew nut, securing elevating wheel.
4. Slide off elevating wheel.

This may sometimes present difficulty, owing to the elevating wheel being tight on the bush, and it may be necessary to resort to the use of the raw hide mallet to drive it off.

5. Remove feather from elevating wheel, bush.
6. Unscrew the jamming bolt with nut and pointer.
7. Unscrew the tumbler nut.
8. Take hold of the outer screw at the top and withdraw it from the tumbler, at the same time bring out the elevating nut attached to it.

This operation can be assisted by applying pressure from below on the bush.

Should there be any washers present on the top of the elevating nut, care must be taken to see that they do not become jammed during this removal.

9. The bush is now removed by pushing up from below, care being taken that the feather-way on the collar of the bush is in alignment with the feathers on the inside of the tumbler.

For assembling.—Reverse the above procedure :—

1. In replacing the bush see that the feather-ways on the collar are in alignment with the feathers on the inside of the tumbler.
2. When replacing the elevating nut see that the washers, if any, are replaced on the top where the tumbler nut bears down on it.
3. When replacing the feather, elevating wheel, see that the punchmark on the feather is to the outside.
4. When replacing the inner screw, make sure that it projects from the top of the outer screw the same distance that the outer screw projects from the top of the tumbler nut.

12. Examination, Adjustment and Repair.

1. For the purpose of examination the following sequence is adopted :—

1. Legs.
2. Socket.
3. Crosshead and pivot
4. Elevating gear.

2. Legs.—

Armourer.

The legs are very strong, but occasionally become slightly bent. These can be straightened in the forge.

If badly bent or dented, they will have to be returned for factory repair.

3. Clutch plates.—

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gunner.

The greatest care must be taken to ensure that the teeth of the clutch plates are kept clean and free from grit.

Armourer.

Burrs on the teeth can be removed by a file, and at the same time make sure that the three screws securing the clutch plates are tight.

It may happen that the "studs, front legs" become bent, thus preventing the clutch plates from seating correctly one against the other. It will then be found impossible to tighten up the clamping handles which should be approximately vertical.

Armourer.

To remedy this fault, the studs will have to be removed and straightened in the forge.

This operation is not easy, and skill and care is required to carry out this repair satisfactorily.

4. The Socket.—

The socket itself is substantial and not liable to come to any harm; the bearing surfaces are shielded from external blows.

Armourer.

Occasionally the clamp screw for checking traverse may be out of action owing to the handle being broken off, or the jamming block becoming worn.

In both cases the nut must be removed, and care must be taken in doing so to remove the fixing pin first.

In replacing a new jamming block it must be ensured that the end of the steel screw does not protrude so as to cut into the pivot itself.

The upper and lower bearings in the socket must be kept clean and free from grit.

5. Crosshead.—

i. Pivot.

Armourer.

Examine the upper and lower bearings for wear. These bearings should be absolutely smooth and true, and must not be filed, except to remove small burrs, and then only with a dead-smooth file.

Armourer.

If these bearings are found to be badly worn the same remedy applies here as is mentioned in the last paragraph of the previous section.

Ascertain that the pivot is right home in its bearings, and that its movement is not in any way interfered with by incorrect fitting of the direction dial.

Should the pivot not seat correctly, the jamming block will cut into the pivot bearing instead of running in the channel provided, and the pivot will be unsteady.

ii. Joint.

It is often found that the jaws have become widened, and consequently, when the gun is mounted, there is considerable lateral play.

This widening is brought about by various causes, continual tapping on the rear portion of the gun being mainly responsible.

Armourer.

This defect can easily be put right. The metal of which the casting is made is soft, and by judicious knocking with a raw-hide mallet, or perhaps a block of wood, the blows being given alternately, on either side of the jaws, the jaws can be closed to any degree of tightness, until the gun can be slipped into position, with a slight pressure.

A metal hammer must on no account be used.

6. Bearings.—

From the continual insertion and withdrawal of the crosshead joint pin, these bearings become very much worn in time, and become a prevalent source of unsteadiness. This unsteadiness is much accentuated, should the jaws be too wide.

There is no satisfactory method of treating this defect short of re-bushing.

Keeping the jaws well up will, in a great degree, overcome this unsteadiness.

Factory repair.

7. Joint pins.

These pins must be straight and smooth,

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gunner.

and should make a good sliding fit through crosshead and gun.

They must not be filed down in any way to make a loose fit. Except for the removal of any small burrs, which can be taken off with a smooth file, they must not be otherwise interfered with.

To remedy play in joint pins, paper or thin cardboard washers will be found effective as an expedient.

Armourer.

The pins are provided with a feather which serves a useful purpose, and these are not to be removed. Should they become broken off they can be replaced.

Should the pins become very badly worn they should be replaced by new ones.

8. Elevating gear.—

i. Joint pins.

The same remarks apply to these pins as to the crosshead joint pins. If they become very badly worn they should be replaced.

ii. Tumbler.

It may be found that the tumbler becomes loose on its trunnions, due to the wear of the tumbler pins in their bearings; this gives rise to lateral play.

Armourer.

This can be overcome temporarily by removing the tumbler and swaging in the bearings with a "ring punch."

iii. Elevating nut.

Slight vertical play in the elevating nut

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gunner.

may arise from wear between the collar of the bush and the shoulder of the tumbler.

This may be taken up by loosening the jamming bolt, screwing in the tumbler nut and retightening the jamming bolt.

Armourer.

Should this wear be so great that, even though the tumbler nut is screwed in to its limit, there is still vertical play, it will then be necessary to insert a thin metal washer or washers on top of the elevating nut. Tinplate washers being provided for the purpose.

As a temporary expedient a cardboard washer can be used.

iv. Elevating wheel.

Armourer.

When appreciable end wear is shown between the hub of the elevating wheel and the bottom of the tumbler, it may be possible to take this up by screwing up the nut, securing elevating wheel.

v. Outer and inner screws.

When the threads become much worn, and appreciable play occurs, the screws, together with the elevating nut as a complete unit will have to be exchanged.

9. Direction dial.—See that the direction dial is so fitted as to ensure that the crosshead bears on the socket, and not on the dial, and have any defects in this respect immediately remedied by the armourer.

13. List of component parts, &c.

Designation.	Details.	Number.
COMPONENTS.		
Blocks, centring gun, R. and L.	M.B. each with 2 screws*	1
Bolt, jamming elevating gear	Steel	1
Bush, wheel, elevating ...	M.B., with nut and steel feather.	1
Chain, securing, elevating screw.	Steel	1
Crosshead	M.B. (also pivot) with keep pin.	1
Dials, direction, Marks I or II	Complete	1
Handles, jamming, front leg	Steel	2
Legs—		
Front, left	Steel, tubular; with shoe and serrated joint.	1
Front, right	Steel, tubular; with shoe and serrated joint.	1
Rear	Steel, tubular; with shoe and forked serrated joint	1
Nuts—		
Elevating	Steel	1
Jamming, rear leg ...	Steel, with handle ...	1
Screw, clamp checking traverse.	M.B.	1
Pins, joint—		
Elevating, gear, Mark II ...	With securing chain with loop, 3 rings, swivel, keep pin and washer.	1
Crosshead, Mark II ...	With securing chain with loop, "S" hook, 2 rings, swivel, eye and washer.	1
Rear, leg	Steel	1

* The two screws for the right block which also secure the direction dial pointer are longer than those for the left block.

13. List of component parts, &c.—(continued).

Designation.	Details.	Number.
COMPONENTS—continued.		
Pins, tumbler	Steel, with split fixing pin	2
Plates, inscription	G.M. with screws ...	1
Pointers, direction dial, Marks I or II.	With 2 securing screws...	1
Pointers, elevating ... ..	... ..	1
Screws—		
Elevating	Steel in 2 parts (inner and outer).†	1
Clamp checking traverse...	Steel with handle, M.B. nut and jamming block.	1
Socket	M.B. with steel clutch plates (for pivot of cross-head).	1
Spring, disc	For studs, joint, front legs	2
Straps, securing, 1 inch by 36 inches.	Leather (for housing legs)	1
Studs, joint front legs ...	Steel, with nut and keep pin.	2
Tumbler, elevating gear ...	M.B., with nut	1
Wheel, elevating "B" ...	M.B.	1

* Obsolescent.

† Issued with nut, elevating, as a complete unit.

CHAPTER IV.

DESCRIPTION OF VARIOUS COMPONENT PARTS.

14. Belts and belt boxes.

1. The gun is supplied with cartridges from a belt (to hold 250 rounds), which passes from right to left through the feed block. This belt is formed by two pieces of webbing connected together by eyelets and brass strips of two lengths, the projecting strips showing how far the cartridge should be inserted. The belt is made thick at the edge next the bullets by being folded over a piece of cord, so that the cartridges may be kept level in passing through the feed block and lie evenly in the ammunition belt boxes.

2. There are three types of belt boxes, one of metal and two of wood. The metal belt box, which holds one belt and is the normal issue, has a hinged lid in two parts, hinged together at the middle, so that only one part need be open when the belt is passing through the gun; this part can be held open at an incline by a strap detachably connected to the unopened part of the lid, the whole thereby forming a rain guard. When closed the lid, as one unit, is secured by quick release straps.

There are three patterns of metal belt boxes known as Nos. 7, 8 and 9. They vary only in minor detail. No. 8 only will be manufactured in future.

Of the two types of wood box the No. 3 Mark III holds one belt, and is supplied for use with the Mark III parapet

carriages; it has a hinged lid which is secured by a spring catch, and a metal stay for keeping the lid partly open, at an incline when the belt is passing through the gun, so that the lid may form a rain guard.

The No. 1, Mark II box is of teak and holds two belts. It has a sliding lid, and is supplied for use with Marks I** and II parapet carriages and cone mountings.

Note.—The parapet and cone mountings and wood belt boxes are obsolescent.

15. Chest, Vickers or Lewis, .303-inch M.G.,
Mks. II and III.

The chest is made of wood. The lid is hinged, and is fastened with two hasps and turnbuckles. A rope handle is attached to each end of the chest by a cleat. The chock, which is provided for the muzzle end of the gun, is made reversible in order to meet the difference in size of the barrel casing of the Vickers gun and the radiator casing of the Lewis gun respectively. A small number of chests of Mark I pattern have been made. These differ only in the depth, which is $\frac{1}{4}$ inch greater. The Mk. III differs from the Mk. II only in that the canvas strip at the back is secured to the lid by a metal strip instead of a leather strip.

The chests take the contents detailed below:—

Gun	...	...	...	...	1
Barrel, spare	...	...	...	...	1
Rod, cleaning, M.G.	...	...	...	...	1

The weight, empty, is about 38 lb.

Note.—When a G.S. limbered wagon has fittings to take the gun the chests will be required only for transit purposes to and from store.

16. *Case, spare barrel and cleaning rod, .303-inch M.G., Mark II.*

The case is a leather tube 34.5 inches long by 1.6 inch diameter (internal measurements) pointed at one end, and fitted with a leather cap and strap at the other. The case is also provided with two straps with buckles for securing it to the tripod hanger of .303-inch M.G., packsaddlery.

17. *Sights, night.*

1. *Description.*—These sights take the place of the luminous sights originally provided.

The foresight consists of a vertical, rectangular, sheet steel plate, $1\frac{7}{16}$ by $2\frac{3}{8}$ inches, shaped and pierced to form sighting features, and mounted upon a steel body with spring arms, by means of which it is attached to the protecting wings of the sliding sight of the deflection bar foresight. It can also be attached to the foresight bracket of the gun if required.

The sighting features consist of a barleycorn, formed centrally on the upper edge, below this an aperture, then a rectangular opening having an inverted barleycorn projecting from its upper edge, and a combined aperture and blade from its lower edge, whilst a notch is cut in each side to indicate normal limits of traverse, the spacing being equal to about one degree of angle in each direction.

The foresight is assembled to the sliding sight of the deflection bar foresight by being sprung on to the protecting wings from the side which faces the breech of the gun.

The backsight, apart from the omission of the radium

tubes and tube plates, is identical with the No. 2 luminous backsight with shield, previously employed.

It consists of a vertical rectangular steel plate about 1.5 inch in diameter, pierced to form a sighting aperture about 1.5 inch in diameter, and below, to the right and left of the aperture, two small rectangular openings behind which a background of luminous paint can be employed if required as a guide to the position of the aperture. The plate is secured to a small steel body, to which is attached a spring clip for engagement with the tangent sight slide of the gun. The sight is assembled to the slide by pressing it on to the projecting blade portion from the left, care being taken to see that the horizontal edge of the body rests on the upper edge of the blade, and that the bent lip on the right of the spring engages over the inner edge of the slide.

2 The night sights are carried in Boxes, Lamps, Aiming, Machine Guns.

18. *Foresight, bar deflection.*

The sight is of steel and consists of:—

- (a) A bar about 10 inches in length, graduated in intervals of 10 minutes, and degrees up to 7 degrees right and left of the centre line.
- (b) An inverted U-shaped bracket to which the bar is a fixture, and which is arranged to assemble over the protecting wings of the ordinary gun foresight, where it is secured by a screw in the left side of the bracket and a spring stud in the right, the former engaging in the hole in the left wing and the latter in the opening in the right wing.

The upper surface of the bracket is graduated in 10-minute intervals, in continuation of the graduations on the bar, the centre line being indicated as zero.

- (c) The sliding sight with clamp screw for fixing in any desired position on (a).

The sight has a central blade and protecting wings, and is arranged to take night sights when required for night firing.

Two indices are provided on the slide to register respectively, with the scale on (a) and on (b).

Instructions for assembling sight to gun.—Turn fixing screw of bracket outwards towards the stop, then press bracket downward over foresight protecting wings of gun until lower end of arms of bracket seat on base of sight bracket of gun and spring stud engages opening in right wing; then turn fixing screw inward until its point engages firmly in hole in left wing.

Care must be taken to see that excessive pressure is not applied to the screw, as such will distort the sight protecting wings of gun, and thereby affect the level of the bar.

The sight protecting wings of gun may require adjustment in order to permit of correct assembly of sight and to bring bar of sight into a truly horizontal position; this position can be determined by observation in conjunction with stem of tangent sight to which it should be at right angles when the latter is upright.

19. Condenser, steam.

1. *Description.*—The condenser is provided in order that the escaping steam from the gun, produced after

about 600 rounds rapid fire, may be made as invisible as possible; by condensing the steam it also conserves the water.

It consists of (a) a 6 feet length of flexible metallic tubing to one end of which is soldered a brass elbow joint with a quick release cap and spring for connection to the adapter on the condenser boss of the gun, (b) an ordinary two-gallon petrol can to which is attached, by means of a wire clip bolted to the handle, and a length of brass chain with swivel ring and "S" hooks, a brass filler spout of the type which screws on to the can, and permits of an even flow from the can; the outlet end of the filler is of a size suitable for insertion in the filling hole of the gun.

The cap of the gun is secured against loss by a shackle consisting of a steel wire stirrup which engages the ordinary wire holes in the cap, a split pin and washer forming a swivel, and a length of brass chain, one end of which connects with the swivel and the other end to the "S" hook of the filler which is attached to the eye of the cap next the cap.

The adapter is permanently fitted to the condenser boss of the gun, and when the quick release cap is connected to it, the elbow joint is pressed into engagement with the steam outlet in the gun by the spring in the cap.

Instructions for assembling the condenser to the gun

2. Apply the projections of the cap on the elbow joint into the entrance grooves of the adapter on the gun, and press the cap inward until the projections are free to turn around the inner shoulder of the collar of the adapter,

when, by reaction of the spring, they will automatically engage in the locking notches in the collar, located at 90° from the entrance grooves. Then insert the free end of the tubing into the petrol can, which should be about two-thirds full of water.

3. An earlier pattern of condenser differs from the pattern described in the foregoing in that a hollow brass ferrule is soldered to one end of the flexible metallic tubing, and a free union nut, having projecting bosses, formed to provide a grip, engages the ferrule and screws on to the condenser boss of the gun, so jointing the ferrule to the steam outlet in the gun.

In this pattern the tubing projects at right angles to the gun, whereas the elbow joint of the latter pattern enables the tubing to lie close to and parallel with the gun. No more of this earlier pattern will be made.

A waterproof canvas bag having a carrying strap and a small strap to close the mouth of the bag, is employed with the earlier pattern and may be used also with the later pattern, pending the issue of petrol cans to all units.

When the bag is used, the free end of the tubing is bound tightly with any type of rag and inserted into the mouth of the bag which is then closed around the tubing, leaving the opening clear of the tubing but confining the bound end within the bag to prevent it from working out.

The bag should be about half filled with water.

No more bags will be made.

Note.—In order to avoid injury, the tubing should be disconnected from the gun when not required for use and, when possible, during transit.

19A. Blank firing attachment.

1. *Description.*—Special details :—

- Barrel, Mk. II, "D.P.B." (Drill purposes, blank).
- Cone, front, muzzle attachment, blank.
- Cup, muzzle attachment, blank.
- Nut, adjusting, muzzle attachment, blank.
- Screw, adjusting, muzzle attachment, blank.
- Spanner, muzzle attachment, blank.

The barrel is specially choked at the breech, and is marked "D.P.B." on the trunnion block. It replaces the ordinary service barrel when the gun is required for firing blank ammunition.

The muzzle cup assembles to the "D.P.B." barrel in the usual manner.

The adjusting screw is screwed into the front cone from the rear, so that its large end may engage in the muzzle cup.

The front cone with adjusting screw assembles into the outer casing of the muzzle attachment in place of the existing front cone.

The adjusting nut screws on to the projecting end of the adjusting screw and locks against the face of the front cone.

The spanner is suitably arranged for the muzzle cup, adjusting screw, and nut.

Note.—The adjusting screw at present in use will be modified in due course by blocking up the front portion of the "through" hole with a tapered plug which will be secured by riveting the small end of the plug over the end of the screw. In future manufacture the screw will be bored at the rear end only. The present screw will

be known as "Mark I", the modified screw as "Mark I* No. 2", and new screws, of the modified type, as "Mark I* No. 1".

2. *Adjustment of the gun when assembled with the special parts.*—The weight required to withdraw the recoiling parts of the gun to the rear when tested by pull of spring balance applied to boss of crank handle should not exceed 2 lb. (fuzee spring removed).

The weight of fuzee spring when tested by pull on crank handle should be about $4\frac{1}{2}$ lb.

The adjusting screw of the muzzle attachment should first be screwed inwards to the muzzle cup until it just commences to force the recoiling portions backward; it should then be unscrewed two and a half turns and secured in position by the nut. The screw may require further adjustment in order to obtain correct functioning, but in no case should the screw be less than one turn back from the muzzle cup. Adjustment should be made in quarter turns.

Note.—The modified type of adjusting screw will give more power than the present screw, consequently it should rarely be necessary to adjust it closer than two and a half turns from the muzzle cup.

3. A 250-rounds belt, preferably part-worn as regards size of pockets, should be employed. The blank ammunition should be inserted by hand, crimped end flush with front edge of belt, in groups of 10 rounds each. This number is sufficient for the purpose of locating machine-gun fire and also ensures a longer life of choke in the barrel, which in time becomes enlarged owing to the action of the hot powder gases.

When firing becomes noticeably irregular, the barrel should be set aside for special examination and gauging, either by the Assistant Inspector of Armourers or C.I.S.A.'s Examiners on tour, whichever is the most convenient.

The barrel casing will be filled with water as for ball ammunition.

Normally, all serviceable guns will be equipped for ball firing. Consequently, the special details for blank firing will only be fitted when actually needed.

When the gun is fitted with the blank firing attachment, it cannot be placed in its chest unless the outer casing of the muzzle attachment with its fittings is first removed.

On completion of blank firing the guns will immediately be restored to their normal condition for firing ball ammunition.

The special details for blank firing may be used with "D.P." guns for instructional purposes but not for firing. Service guns only will be used for firing.

CHAPTER V.

THE MECHANISM.

20. General remarks.

A *theoretical knowledge* of the mechanism is not sufficient. Instruction must be so thorough and practical as to ensure that all mechanical operations are performed correctly from force of habit, so that they will be carried out instinctively in moments of excitement. Imitation will not be carried out by private soldiers under instruction in mechanism.

Note.—(1) A belt and dummy cartridges will invariably be used for purposes of instruction.

(2) A service lock must always be in the gun, when firing either ball or blank ammunition. For instructional purposes, when ammunition is not being fired, the D.P. instructional lock should be used in the gun whenever possible.

21. Sequence of instruction.

1. The following is the correct sequence in which instruction in mechanism should be given. Each stage should be thoroughly understood before proceeding to the next :—

- i. To load.
- ii. To fire.
- iii. To unload.
- iv. Action on recoil.
- v. First action in the feed block.

- vi. Backward rotation of the crank.
- vii. Second action in the feed block.
- viii. Backward movement of the lock.
- ix. Cocking action of the lock.
- x. Action of the fuzee spring.
- xi. Forward movement of the lock.
- xii. Firing action—first shot.
- xiii. Firing action—subsequent shots.
- xiv. Action inside lock when pressure on thumb-piece is released.

2. Kit required :—

- i. Gun (with D.P. lock if available) and tripod.
- ii. Belt in belt box.
- iii. Dummy cartridges.
- iv. Empty case (dummy without bullet).
- v. Spare lock and spare feed block.
- vi. Skeleton lock.
- vii. Instructional diagram.

Note.—The gun must be correctly set up.

22. To load.

- (a) Pass the tag end of the belt through the feed block from the right side.
- (b) With the right hand pull the crank handle on to the roller.
- (c) With the left hand pull the belt through to the left front, as far as it will go.
- (d) Let go the crank handle. The first cartridge will then be gripped by the extractor. Repeat the above, and, when this has been done, the first cartridge will be in the chamber, and another gripped by the upper part of the extractor. The gun is then ready for firing.

Note.—The crank handle is pulled on to the roller in order to withdraw the lock. This is necessary in order to allow the cartridge to be pulled into position in the feed block, to allow the extractor to drop, and to cock the lock.

Method of Instruction.

Demonstration.—Load.

Explanation—

- (1) Tag of belt.
- (2) Crank handle pulled on to roller.
- (3) Belt pulled slightly to the left front.
- (4) Crank handle released.
- (5) Repetition of above.
- (6) Cartridge in chamber.
- (7) Cartridge gripped by extractor.
- (8) Gun ready for firing.

Interrogation.

23. To fire.

Raise the safety catch and press the thumb-piece of the firing lever, when the gun will fire automatically until—

- (a) Pressure is released ; or
- (b) Ammunition in the belt is expended.

In the case of (a) the lock will be home, and the extractor will be gripping a live cartridge in the feed block, and a live cartridge in the chamber. In the case of (b) the extractor will be clear.

Method of Instruction.

To set up the gun—load.

Demonstration.—Press thumb-piece.

Explanation—

- (1) Safety catch raised.
- (2) Thumb-piece pressed.
- (3) Rounds on extractor when pressure released.
- (4) No rounds on extractor when belt finished.

Interrogation.

24. To unload.

To unload the gun.—Pull the crank handle on to the roller twice in succession (without pulling the belt), letting it fly forward to check lever each time. Release the top and bottom pawls, and remove the belt from the feed block ; then release the lock spring.

Method of Instruction.

To set up the gun—load.

Demonstration.—Unload.

Explanation—

- (1) Crank handle pulled on to roller twice.
- (2) Pawls released from belt.
- (3) Belt removed and repacked.
- (4) Thumb-piece pressed.

Interrogation.

25. Action on recoil.

Suppose the gun to have just fired the first cartridge. The extractor will be gripping the second live cartridge in the feed block, and the empty case, which has just been fired, in the chamber. The explosion will cause the

recoiling portions to move backwards through a distance of about 1 inch, thereby extending the fuze spring.

This backward movement is due partly to recoil, and partly to the effect of the muzzle attachment, which acts as follows :—The powder gases which escape through the muzzle after the exit of the bullet strike violently against the front cone, and rebound on to the front face of the muzzle cup, thereby assisting to drive the recoiling portions backwards. The gases then escape through the vents in the outer casing.

Method of Instruction.

To set up the gun.—

Remove the outer casing of the muzzle attachment.

Load the gun with empty case in the chamber and a dummy round in the feed block, press the thumb-piece, remove the fuze spring and box, and raise the rear cover; hinge down the rear cross-piece, remove the right slide and refix the rear crosspiece.

Demonstration.—Push back recoiling portions from the front.

Explanation—

- (1) Explosion.
- (2) Recoiling portions driven back one inch.
- (3) Fuze spring extended.
- (4) Action of gases in muzzle attachment.

Interrogation.

26. First action in the feed block.

As the recoiling portions travel backwards, the recess in the prolongation of the left side-plate carries with it

the stud on the bottom lever of the feed block. The bottom lever, acting on the top lever, causes the slide and the top pawls to move to the right, enabling the top pawls to engage behind the cartridge, already held in position by the bottom pawls.

Method of Instruction.

To set up the gun.—Remove the outer casing of the muzzle attachment. Load the gun with an empty case in the chamber and a dummy round in the feed block, press the thumb-piece, remove the fuze spring and box, and raise the front cover.

Demonstration.—Push back the recoiling portions from the front.

Explanation, using diagrams—

- (1) Stud on bottom lever.
- (2) Recess in prolongation of left side-plate.
- (3) Bottom lever acting on top lever.
- (4) Slide moving to right.
- (5) Top pawls engaging cartridge held by bottom pawls.

Interrogation.

27. Backward rotation of the crank.

The backward movement of the recoiling portions causes the tail of the crank handle to roll on the roller, thereby rotating the crank. The rotation of the crank draws back the lock, and causes the fuze to wind the fuze chain, thus farther extending the fuze spring.

Owing to the momentum of the lock, connecting rod, crank and crank handle, the crank handle continues to

roll against the roller. This rolling of the crank handle against the roller, assisted by the fuze spring, forces the whole of the recoiling portions forward again, with the exception of the lock, which continues its backward movement for a short distance, before it joins in the forward movement.

Method of Instruction.

To set up the gun.—Remove the outer casing of the muzzle attachment. Load the gun with an empty case in the chamber and a dummy round in the feed block, remove the fuze spring and box and raise the rear cover.

Demonstration.—Backward rotation of crank by smart blow on muzzle cup. Repeat slowly.

Explanation.—

- (1) Tail of crank handle rolling on roller.
- (2) Rotation of crank—withdrawal of lock.
- (3) Fuze spring further extended.
- (4) Momentum of lock, &c., causing crank to rotate farther.
- (5) Barrel and side-plates travelling forwards.
- (6) Lock travelling backwards and then slightly forwards.
- (7) Barrel and side-plates home.

Interrogation.

28. *Second action in the feed block.*

As the recoiling portions go forward, the recess in the prolongation of the left side-plate carries with it the stud on the bottom lever of the feed block. This bottom lever acts on the top lever, which moves the slide and the top

pawls to the left, the pawls thus bringing the third cartridge in the belt to a position against the cartridge and bullet stops, ready to be gripped by the extractor. The belt, as it moves to the left, slides between the bottom pawls, which are depressed as the cartridge passes over them, rising behind the fourth cartridge, holding the belt in position and preventing it from sliding back after the third cartridge has been withdrawn by the extractor.

Method of Instruction.

To set up the gun.—Remove the outer casing of the muzzle attachment. Perform half the loading motions; remove the fuze spring and box; push back the recoiling portions and raise the front cover.

Demonstration.—Recoiling portions forced forwards and slide, moving to left.

Explanation, using diagrams.—

- (1) Recess.
- (2) Stud on bottom lever.
- (3) Bottom lever acting on top lever.
- (4) Slide moving to the left.
- (5) Top pawls engaging next cartridge.
- (6) Cartridge guides.
- (7) Cartridge and bullet stops.
- (8) Bottom pawls depressed and rising behind cartridge.

Interrogation.

29. *Backward movement of the lock.*

As the lock moves backwards, the extractor withdraws the live round from the feed block, and the empty case

from the chamber. The horns of the extractor move along the surface of the cams until the cartridge is clear of the belt. When the extractor arrives at the end of the cams it is forced down by the ramps on the cover, thus bringing the cartridge drawn from the feed block into line with the chamber, and probably causing the empty case drawn from the chamber to fall off. The live cartridge is prevented from slipping down the face of the extractor by the bottom projection of the gib. (If the empty case does not fall off, when the extractor drops, it will be forced off as described in the forward rotation of the crank.)

Method of Instruction.

To set up the gun.—Remove the outer casing of the muzzle attachment. Load the gun with an empty case in the chamber, and a dummy round in the feed block, press the thumb-piece, remove the fuzee spring and box, and raise the rear cover.

Demonstration.—Lock moving backwards by rolling the crank handle on the roller.

Explanation, using diagrams.—

- (1) Withdrawal of cartridge from feed block.
- (2) Withdrawal of empty case from chamber.
- (3) Horns travelling on cams.
- (4) Ramps forcing down extractor.
- (5) Empty case probably falling off.
- (6) Cartridge in line with chamber.
- (7) Cartridge held on face of extractor.

Interrogation.

30. Cocking action of the lock.

The rotation of the crank gives an upward motion to the connecting rod and side lever head, which latter, bearing on the tail of the tumbler, rotates the tumbler on its axis, and thus forces the firing pin to the rear. The long arm of the lock spring acts on the projection of the firing pin, while the short arm bears against the nose of the trigger; consequently the withdrawal of the firing pin compresses the lock spring. As the tumbler rotates, the short arm of the lock spring forces the nose of the trigger over the bent of the tumbler, and the continued rotation of the tumbler forces the firing pin still further back, until the bent of the sear (which is actuated by the sear spring) is forced into the bent of the firing pin and retains it. The firing pin is thus prevented from flying forward.

Method of Instruction.

To set up the gun.—Remove the outer casing of the muzzle attachment. Load the gun with an empty case in the chamber and a dummy round in the feed block. Press the thumb-piece, remove fuzee spring and box, and raise the rear cover.

Demonstration with gun and with skeleton lock.

Explanation, using skeleton lock and diagrams.—

- (1) Upward movement of side lever head.
- (2) Rotation of tumbler.
- (3) Firing pin withdrawn.
- (4) Compression of lock spring.
- (5) Nose of trigger and bent of tumbler.
- (6) Bents of sear and firing pin.

Interrogation.

31. *Action of the fuzee spring.*

When the force of the explosion is expended, the fuzee spring takes command, and unwinding the fuzee chain from the fuzee gives a rotary movement to the crank. This imparts a forward and downward action to the connecting rod and side lever head, thereby causing the lock to continue its forward movement.

Method of Instruction.

To set up the gun.—Perform half the loading motions; disengage the fuzee spring and raise the rear cover; draw back the crank handle and pull the belt.

Demonstration, with fuzee spring attached to fuzee and with box held close to gun.

Explanation.—

- (1) Connection of fuzee spring and chain to crank.
- (2) Forward and downward movement of connecting rod and side lever head.
- (3) Lock forced to continue forward movement.

Interrogation.

32. *Forward movement of the lock.*

As the lock travels forward, the extractor places the live round in the chamber, and is moved upwards by the side levers acting on the extractor levers. The bottom projection of the gib slides over the base of the live cartridge in the chamber and the top projection of the gib slides over the base of the cartridge which has been moved up into position in the feed block. The firing pin hole is thus brought opposite the cap. As the

extractor rises, the empty case, if it has not already fallen off, will be forced off by the seating for ejection.

As soon as the extractor reaches its highest position, the side-plate springs engage in grooves in its sides. This prevents the horns from falling and fouling the front end of the solid cams in the breech casing at the commencement of the backward movement when there are no cartridges on the face of the extractor.) Then the further movement of the connecting rod and side lever head causes the lock to be forced slightly farther forward, and the breech is then closed. During this movement, the steps on the side levers travel over the bents on the extractor levers.

Method of Instruction.

To set up the gun.—Perform half the loading motions; pull the crank handle on to the roller; pull the belt and raise the rear cover.

Demonstration.—Crank handle eased forward on to the check lever.

Explanation, using spare lock.—

- (1) Cartridge in line with chamber.
- (2) Side levers acting on extractor levers.
- (3) Raising of extractor.
- (4) Action of seating for ejection.
- (5) Bottom projection of gib passing over base of cartridge in chamber.
- (6) Firing pin hole opposite pin.
- (7) Cartridge gripped in feed block.
- (8) Side-plate springs.

(9) Further downward movement of connecting rod and side lever head.

(10) Breech closed.

Interrogation.

33. *Firing action (first shot).*

For the first shot.—As the side lever head comes slightly below the horizontal, it depresses the sear, thereby disengaging it from the firing pin, which then moves slightly forward until the bent of the tumbler engages the nose of the trigger. If the safety catch is raised and the thumb-piece on the firing lever pressed, the pawl near the bottom of the firing lever pushes forward the bottom of the trigger bar lever. This, being pivoted in the centre, causes the top to come to the rear, engaging a projection on the trigger bar and drawing it to the rear. As the trigger bar is drawn backwards, the front end of the slot engages and draws back with it the tail of the trigger, thereby releasing the nose of the trigger from the bent of the tumbler. The long arm of the lock spring then propels the firing pin on to the cap, and the cartridge is exploded.

Method of Instruction.

To set up the gun.—Load.

Demonstration, using gun and skeleton lock.

Explanation, using skeleton lock.—

- (1) Bents of sear and firing pin.
- (2) Lock spring forcing forward firing pin.
- (3) Nose of trigger and bent of tumbler.

Using gun.

- (1) Thumb-piece pressed.
- (2) Pawl on firing lever.
- (3) Action of trigger bar lever.
- (4) Tail of trigger drawn back by trigger bar.

Using skeleton lock.

- (1) Nose of trigger disengaged from bent of tumbler.
- (2) Action of long arm of lock spring.
- (3) Firing pin exploding charge.

Interrogation.

34. *Firing action (subsequent shots).*

Subsequent shots.—The firer, by maintaining pressure on the thumb-piece, holds back the trigger bar; therefore, each time the lock goes forward, the front end of the slot holds back the tail of the trigger before the lock is quite home. By this means the nose of the trigger is prevented from engaging in the bent of the tumbler. When the lock is home, the side lever head depresses the sear, thus allowing the long arm of the lock spring to carry the firing pin on to the cap, and the charge is exploded.

The depression of the sear is so timed that the firing pin cannot be released until the lock is in the firing position.

Method of Instruction.

To set up the gun.—Load.

Demonstration, using gun and skeleton lock.

Explanation.—

- (1) Pressure kept on thumb-piece.
- (2) Trigger bar held back.

- (3) Tail of trigger held back before lock goes home.
- (4) Nose of trigger and bent of tumbler.
- (5) Depression of sear.
- (6) Action of lock spring.
- (7) Timing of sear.

Interrogation.

35. *Action inside lock when pressure on thumb-piece is released.*

On releasing pressure on the thumb-piece the trigger bar is allowed to resume its normal position. The short arm of the lock spring forces the nose of the trigger over the bent of the tumbler, so that, when the sear is depressed, the nose of the trigger engages in the bent of the tumbler, and the firing pin is unable to go forward.

Method of Instruction.

To set up the gun.—Load.

Demonstration. using gun and skeleton lock.

- (1) Trigger bar action on release of pressure.
- (2) Action of trigger.

Explanation.—

- (1) Safety catch spring and trigger bar lever.
- (2) Trigger bar spring and trigger bar.
- (3) Depression of sear.
- (4) Firing pin held by tumbler.

Interrogation.

CHAPTER VI.

CARE AND CLEANING.

36. General remarks.

The care and cleaning of the gun is of the greatest importance, in order that the gun may fulfil to the utmost of its power any task demanded of it from a mechanical point of view, and also in order that machine gun officers may have confidence that the maximum results will be obtained from their guns when firing.

37. Responsibility.

Officers commanding units are responsible for the condition of the guns in their charge, and for instruction of their men in the methods of cleaning, so that no unnecessary wear may result.

The greatest care should be exercised in the daily handling of the gun in order to avoid damage to the various parts, particularly the sights, muzzle, &c.

38. Kit required for teaching.

Gun, tripod, spare parts, spare barrel, belts, and belt boxes, and dummy cartridges.

Cleaning rod, double pull-through and gauze.

Flannelette and old linen.

Lubricating oil, turpentine and paraffin.

Mirror reflector and spring balance.

Muzzle protector.

Boiling water.

39. Materials supplied.

Materials for cleaning and oiling machine guns and their mountings will be supplied in the following proportions :—

Description of Materials.	Each Machine Gun and Mounting Peace (per annum).	
	For guns in use.	For guns in store.
Composition, preserving, arms*	—	1½ lb.
Dubbin	½ lb.	—
Flannelette	20 yds.†	6 yds.
Linen or cotton, old	3 lb.	—
Oil, mineral, burning	½ pt.	—
Oil, lubricating, G.S.	8 pts.	—
Turpentine	1 pt.	—

* Or "Mineral jelly, red." Composition will become obsolete when existing stocks are used up.

† 20 yards allowed for Regular Cavalry and Infantry. Authority, "Equipment Regulations, Part I."

"Composition, preserving arms," or "mineral jelly" is of great value for preventing the exterior of machine gun barrels from rusting in the field, and, if obtainable, should be regularly used.

The following will be allowed to each store in which machine guns are kept or dealt with, and will be replaced if necessary—

Flannel (old blanket is very effective)	1 square yard.
Twisted copper wire	1 rod, 42 inches long of wire 0.1 inch diameter in a double twist.

(Authority, "Equipment Regs., Part I.")

40. General points.

The instructor should explain the necessity of the following points :—

Daily examination of guns after cleaning.

Protection from sand and mud ; trench bags, &c.

Careful handling of guns.

Correct assembly of muzzle cup.

Avoidance of damage to the sliding shutter, due to the revolving of the crank handle with no lock in the gun.

Lock spring not left compressed unnecessarily.

Securing of the milled head brushes.

Preservation of the browning on surfaces.

Observation of all points taught in stripping and examination of machine guns.

41. Guns, special remarks.

1. *When in store.*—When guns are returned to store, packed for transmission, or stowed away in any place where they cannot be readily examined, the barrels and unpainted parts should be coated with "Composition, preserving, arms."* The mixture should be made hot, and a piece of flannel dipped in it, with which the exterior parts will be dabbed. The inside of the barrels will be coated with the hot mixture (or mineral jelly red) applied by means of a strip of flannelette placed in the end of the rod of twisted copper wire and drawn through from muzzle to breech. The chamber will be coated with cold mixture.

* See note on previous page.

2. *Wear in the bore.*—This is due to three causes :—

- i. The friction of the bullet.
- ii. The heat generated when ammunition is fired.
- iii. The friction of the pull-through gauze when the bore is being cleaned.

Undue wear is caused by improper and unnecessary use of the pull-through gauze, to prevent which it is most important that the instructions for cleaning be observed. It is recognized that it may be necessary to modify these instructions to suit local climatic conditions, or to suit individual barrels which are in a bad state of preservation.

3. *Rounds fired before barrel becomes unserviceable.*—The life of a gun barrel varies according to the rate and duration of fire, and the care exercised in cleaning, &c.

Cases are known where over 60,000 rounds have been fired from one barrel, e.g., machine guns No. 128 and 131. These two guns were used for firing demonstrations, and the barrels were changed when the dispersion of shots made it necessary, but they were still capable of good shooting.

4. *High polish of the bore a safeguard against rust.*—

When a barrel is new, the bore carries a high polish, and this is a great safeguard against rust and metallic fouling, but it must be recognized that as the bore becomes worn this polish will diminish. Efforts to restore it with wire gauze on the pull-through result in unnecessary wear. At the same time it must be clearly understood that in a machine gun that is well cared for, while the brilliancy of the polish will diminish, the lands of the bore should still be bright and free from all stain of rust and fouling.

5. *Various kinds of fouling.*—In order that the instructions for cleaning may be understood, it is essential that the causes of fouling in barrels should be briefly explained. Fouling may be said to be of three kinds :—

- i. Internal, caused by the forcing of the products of combustion into the pores of the metal.
- ii. Superficial, caused by the deposit in the bore of the solid products of combustion of the charge and cap composition.
- iii. Metallic fouling, caused by a portion of the cupro-nickel of the envelope of the bullet being left on the surface of the bore, and appearing as a whitish streak on the lands, or as a roughness on the edge of the grooves.

The result of neglect in either of the first two cases is the same, viz., the formation of rust in the bore, calling for the excessive use of wire gauze, or even more drastic treatment, thereby causing unnecessary wear.

Internal fouling can be removed satisfactorily by the use of boiling water. If for any reason this method of cleaning cannot be used, the barrel will "sweat" and a hard black crust of fouling will appear in the bore. This will turn to red rust if not removed, and the barrel will then require repeated cleaning with flannelette and with gauze, for a time, which will vary according to climatic conditions and the state of the bore.

Superficial fouling is readily removed when warm by the use of a cleaning rod and flannelette, but if it is allowed to remain long in the barrel it will become hard, and will have a corrosive effect equal to that produced by internal fouling.

The barrel should be carefully watched for the appear-

ance of nickelling or metallic fouling. This, if deposited near the muzzle, or the breech, is visible to the eye when the bore is clean, but in the centre of the bore can only be detected by the use of the gauge plug. It is a cause of inaccuracy, and if a gun, for no apparent reason, shoots badly its presence should be looked for as a possible explanation. The double pull-through and gauze will be used to remove metallic fouling.

6. *Daily cleaning*.—The outside of the gun will be cleaned daily, and all parts of the mechanism wiped with an oily rag; the bore of the gun will always be left oily.

To clean the mechanism mineral burning oil should be used. If any parts are clogged with dried oil, spirits of turpentine should be used to remove it. After each part is cleaned, it should be thoroughly dried and slightly oiled with oil, lubricating G.S. Very little oil should be used for this purpose, as it is apt to catch the dust and clog.

Moving the recoiling portions by working the crank handle after hanging the lock affords a ready means of oiling the recoiling portions and the bearing parts of the barrel, viz.:

- (a) Just in front of the barrel block (to which access can be obtained by removing the feed block), and
- (b) At the muzzle end, in front of the packing gland.

The lock is hung as follows:—Pull the crank handle slowly backwards till the horns of the extractor drop into the steps on the rear face of the solid cams. The barrel and side-plates can now be moved backwards by placing the thumb behind the knob of the crank handle

and the two first fingers on the tail of the handle and rotating it.

No oil other than lubricating G.S. should be allowed to remain in the bore. The function of this oil is to cover the bore with a waterproof film, and thus prevent moisture from attacking the steel and forming rust. It must be well worked into the flannelette with the fingers, otherwise it will be scraped off by the breech end of the barrel. When paraffin has been used, all traces of it should be thoroughly removed and the part coated with oil, lubricating G.S., for paraffin, though an efficient agent for removing rust, does not prevent its formation.

7. *Weekly cleaning*.—The gun should be thoroughly overhauled and cleaned each week.

The oil should be removed from the bore, and replaced by fresh oil. In cases where the bore has once become rusty, it should be wiped out with flannelette, and then cleaned with the gauze on the pull-through.

42. To clean the barrel.

1. Pull the crank handle on to the roller, open the cover, raise the lock and let it go forward slowly and rest upon the top of the breech casing. Take off the outer casing and muzzle cup of the muzzle attachment. Place a piece of flannelette, about 4 inches by 2 inches, in the eye or slot of the cleaning rod, care being taken that the latter is surrounded with flannelette, which should be well oiled; then insert the rod into the muzzle of the barrel, placing the movable bush on the muzzle, and pass it up and down till the barrel is clean; replace the oiled flannelette by dry pieces: inspect the bore by means of the mirror reflector, and finally pass freshly oiled pieces

through the bore, leaving the barrel slightly oiled. If the passage of the flannelette through the breech is stiff, and force is required, it is necessary that the flannelette be reversed on the rod before being withdrawn.

2. When the gun has been fired, daily cleaning of the barrel is necessary for at least ten days afterwards. Subsequent cleaning must depend on the discretion of the officer in charge of the gun; in a dry climate once a week should be sufficient, but in situations where the barrel is exposed to a moist atmosphere it may be necessary daily. The bore should at all times be left coated with oil.

3. For use on the double pull-through wire gauze in pieces $2\frac{1}{2}$ inches by $1\frac{1}{2}$ inches is supplied, and should be used for the removal of hard fouling or of rust. In attaching it to the pull-through the following method should be adopted:—

Turn the shorter sides of the gauze towards the centre, so that the longer sides take the form "S." Open the loop of the pull-through and put one side of it in each loop of the "S." Then coil each half of the gauze tightly around the portion of the cord over which it is placed, till the two rolls, thus formed, meet.

The object of the gauze is mainly to scour out the grooves, and it should therefore fit the bore tightly. When it fails to do this it should be partially unrolled, and packed with paper or flannelette to increase its bulk.

Grit must be removed from the gauze and pull-through before use, and these should be thoroughly oiled.

4. Cleaning with gauze entails wear of the bore.

Gauze should not be pulled through the barrel more often than is laid down. The surest way of preventing the necessity for the continued use of the gauze is to keep the bore oiled so as to prevent rust. A barrel which has become rusty will always be more liable to rust than one which has been kept in good condition. It will therefore require more attention and more frequent cleaning with gauze. Similarly, a barrel which is showing signs of wear will require more care than one in which the surface has not been attacked, for, the eroded portion being rough, moisture is more likely to collect on it and form rust. It is also more difficult to remove rust thoroughly from a rough surface than from a smooth one.

5. When cleaning D.P.B. barrels care must be taken to avoid putting pressure from the muzzle end on the front of the bush in the chamber, as the bush, having been driven in from the breech, is liable to be driven backward from its correct position, so preventing the cartridge from being fully inserted into the chamber. A bright surface in the bore of this barrel is not called for, but the chamber should be kept in good condition.

43. To use the double pull-through.

1. Remove the barrel, place the muzzle protector in position, and, having thoroughly oiled the gauze, drop the weight through the bore from the breech end. Fix the barrel in a vice, or have it held firmly by two men, and with the assistance of another man pull the cord backwards and forwards until the fouling or rust is loosened; when the gauze is worn out, it should be replaced by one of the spare pieces which are issued with each double pull-through.

When signs of wear appear, a new cord should be taken into use, to avoid the risk of the pull-through breaking in the bore. If a breakage does occur, the barrel must at once be taken to the armourer. No attempt should be made by the gunner to remove the obstruction.

Great care must be taken to avoid cord wear at the breech end of the barrel. The barrel can now be cleaned with the cleaning rod and flannelette as described above.

2. *Cleaning after firing.*—Guns will be cleaned immediately after firing. The fouling can easily be removed while it is still warm and before it has had time to set hard. The less the time that is allowed for the fouling to exercise its power of absorbing moisture from the air, the less chance is there of rust forming.

3. *Cleaning with boiling water.*—An effective means of cleaning the bore, whether firing has taken place or not, is found in the use of boiling water. Before boiling water is used, the barrel should be taken out of the gun, and superficial fouling and grease removed. About 5 or 6 pints should be poured through the bore from the breech, using a funnel for the purpose. The bore should then be thoroughly dried and oiled. Not only does the boiling water remove the fouling, but the expansion of the metal due to the heat of the water loosens any rust there may be, and makes it easily removable.

4. *In sandy countries.*—Great care is necessary in the quantity of oil to be used. A thin film of oil, *i.e.*, parts wiped over with a slightly oiled rag, will prevent rust during the night and also be sufficient lubricant for working the gun during firing.

5. *In frosty weather.*—Oil the mechanism very slightly.

Try to prevent the water in the barrel casing from freezing by the following methods :—

- i. Wrap straw, blanket or sacking round the barrel casing.
- ii. When dismantled, place the gun between the men of the section when resting.
- iii. Add to the water 20 per cent. of glycerine or 33 per cent. glycerine residue, whichever is available, and ensure that no more than 5 pints of the solution are in the barrel casing. Care must be exercised in using glycerine in closed emplacements as it will give off harmful fumes if the water boils.
- iv. It may sometimes be useful to keep one lock wrapped in a dry rag in a man's pocket provided care is taken that it does not leave the gun position.

44. *Points to be attended to before firing.*

1. The surfaces on which all movable parts work should be thoroughly well oiled with oil, lubricating G.S., especially the following :—

Bearing parts of the barrel and all recoiling portions. The lock guides on the side-plates, also the working parts of the lock itself, especially the levers and extractor.

Face of the feed block.

Bearings of the crank, the extractor stop on the front cover, the curved ramps, lock guides and trigger bar on the inside of the rear cover, and the check lever.

2. In order to see that the recoiling portions work freely, cock the lock, remove the fuze spring box and spring, turn the crank handle upwards, take hold of it with the right hand and the fuze with the left, move the recoiling portions with the gun horizontal, backwards and forwards, to see that they work freely and also that the barrel goes close home forward. The weight necessary to move the recoiling portions should not exceed 4 lb.

3. Replace the fuze spring and weigh it with the spring balance (*vide* Section 34).

4. Thoroughly dry the bore, muzzle cup and muzzle attachment. See that the muzzle cup is firmly screwed up. Examine the lock, feed block, firing lever, safety catch, &c.

5. See that the barrel casing is filled with water. To fill the casing, remove the screwed plug at the breech end and also the cork plug, pour in the water and replace the plugs. In climates where the temperature is likely to fall much below freezing point, not more than about 5 pints of water should be put into the barrel casing; and 20 per cent. of glycerine or 33 per cent. of glycerine residue, whichever is available, mixed with the water, will prevent it from freezing quickly.

6. Ensure that the handles have been filled with oil, and ascertain that the spare parts box and case and their contents, and the cleaning rod, are with the gun.

7. Examine the belts, inspect the brass strips, see that the belts are correctly filled and packed carefully in the belt boxes. Keep the belts dry if possible; should they

get wet lay them out to dry. New or stiff belts should be well plugged.

8. Should the water in the barrel casing become frozen, *on the gun being fired, the barrel will probably not recoil far enough to work the gun and will remain back.* To remedy this pull the crank handle on to the roller, then bring it back to a vertical position and force the barrel to the front, pulling the belt if necessary; let the crank handle return to the check lever and fire the gun. This should be repeated until the barrel recoils correctly.

9. See that the condenser tube is fitted to the gun.

10. Examine the tripod.

45. *Points to be attended to during firing.*

1. See that a sufficient supply of water is kept in the barrel casing so that the barrel is never uncovered.

The water in the barrel casing begins to boil when the gun has fired about 600 rounds with the greatest rapidity; after this, if the firing is continued, the amount of water evaporated is about $1\frac{1}{2}$ pints for each 1,000 rounds. When the barrel casing is filled with water, about 2,000 rounds may be discharged at short intervals without replenishing, but this depends upon the rapidity with which the gun is fired.

2. The belt is on no account to be pulled when the gun is firing.

3. During a temporary cessation to fire, oil the lock and all frictional parts, remove a partly used belt and replace it by a full one. See that the clamps of the tripod legs have not worked loose.

4. Keep the belt always in line with the feed block, and

the ammunition box, if possible up to, but not above, the cross head-joint pin.

5. See that the belts are refilled without delay.
6. See that the muzzle cup has not worked loose.
7. See that the condenser is attached to the condenser tube before the water boils.
8. See that repairs receive immediate attention.

46. Points to be attended to after firing.

1. See that the gun is unloaded.
2. See that the chamber, bore and muzzle cup are well oiled immediately after firing.
3. See that the lock spring is released.
4. See that any live cartridges that happen to be among the cases are collected.
5. On return to barracks the gun and barrel should be thoroughly cleaned as soon as possible. The water must be drained out of the barrel casing. The lock should be examined to ensure that it is not damaged. The barrel must be removed and carefully dried and oiled, the outside of the barrel being oiled as well as the bore. Ammunition belts should be examined, and if wet or damp should be hung up to dry.
6. Tripods should be cleaned.

47. Table of points before, during, and after firing.

(a) Before firing.

1. Examine barrel, spare parts, &c.
2. Oil up. (Bearing parts of barrel and recoiling portions; lock guides; working parts of lock, especially levers and extractor; crank bearings; ramps; trigger bar and check lever.)
3. Dry the bore, muzzle cup and muzzle attachment.

4. Muzzle cup to be firmly screwed up.
5. Test and weigh recoiling portions.
6. Weigh fuze spring and lock spring.
7. See to water supply.
8. Oil in handles, &c.
9. Examine belts.
10. Action to be taken in very cold weather.
11. Examine tripod.
12. Secure gun mounting, &c., if for travelling.
13. See condenser tube attached.

(b) During firing.

1. Belts refilled.
2. Watch water supply.
3. Movement of belt not impeded.
4. Temporary cessation, oil up and change belt, &c. Oil up bearing parts of barrel and recoiling portions; lock guides; working parts of lock, especially levers and extractors; crank bearings; ramps; trigger bar and check lever.)
5. Ammunition box up and in line.
6. See clamps of tripod legs not loose.
7. Muzzle cup tight.
8. See condenser attached.
9. See breakages attended to.

(c) After firing.

1. On the range.—

1. Unload.
2. Open rear cover, remove lock and drop rear cross-piece.
3. Remove outer casing of muzzle attachment and muzzle cup.

4. Clean the barrel of superficial fouling with the cleaning rod, oiled flannelette, followed by dry flannelette.

5. Depress gun, insert the weight of the double pull-through in the breech, pass it through the barrel and attach the muzzle protector to the barrel.

Pass loop end of double pull-through under the crank; replace the lock in the "clear gun" position and then operate the pull-through in the usual manner.

6. Oil the face of extractor and point of firing pin and replace lock and rear-crosspiece.

7. Remove muzzle protector, oil barrel with cleaning rod and flannelette, oil and reassemble cup and outer casing of muzzle attachment.

8. Secure gun, mounting, &c., as if for travelling.

9. Sort live rounds from empty cases.

ii. *After return to barracks.*—

1. Strip gun.

2. Pour boiling water through the barrel, allow the barrel to dry and cool off, and then use the double pull-through and oil.

3. Clean the other parts of the gun, special attention being given to the cup and the interior of the outer casing of muzzle-attachment, face of extractor and point end of firing pin, and examine gun thoroughly.

4. Overhaul tripods, belts, belt boxes, spare parts and ammunition.

5. Dry wet belts.

48. *Tripods.*

Care must be taken that the jamming handles do not get bent, that the chains securing the joint-pins do not get broken, that the dials do not get damaged. The

elevating gear must not be allowed to work loose. The serrations must be kept clean, and the jamming handles must not be clamped, unless the serrations coincide. Tripods should be thoroughly overhauled and cleaned periodically.

For other details of the tripod *see* Chapter III.

49. *Belts.*

1. Belts should be frequently examined; they should be kept free from dirt, should not be torn, and the brass strips should not be bent or broken. Belts should be kept free from moisture and oil. New belts must be plugged, but care must be taken in the use of the belt plug, or loose pockets will result.

2. To clean a dirty or greasy belt. Soak it for two hours in a solution containing 1 part soda, 3 parts soft soap, and 10 parts water. The belt should then be scrubbed and hung up to dry and plugged when dry.

50. *Belt boxes.*

They must be frequently inspected, especially the metal boxes.

If metal boxes are dented, filled belts cannot be withdrawn freely.

Dirt, &c., must be cleaned out from the interior, and all traces of mud removed from the exterior. The outside of metal boxes should be wiped periodically with a slightly oiled rag.

51. *Ammunition.*

This must not be subjected to extremes of temperature. It must be kept dry and clean, and when in belts must be

examined daily and the rounds turned. Small particles of grit, sand, earth, &c., are very liable to get fixed to the rim of a cartridge, or even on the bullet. The result may be either a stoppage or a bulged barrel. On no account must ammunition be oiled.

52. *Anti-gas measures.*

As a protection against gas, the lids of belt boxes must be kept closed, and guns covered with waterproof sheets. In the case of a gas attack, either hang the lock and work the recoiling portions, or keep the gun firing. After a gas attack, guns should be cleaned as soon as possible. Oiling will prevent corrosion for about 12 hours, but when opportunity occurs clean all parts in boiling water containing a little soda. All traces of gas must be removed from the ammunition with a slightly oiled rag, and then the ammunition must be thoroughly dried.

CHAPTER VII.

STRIPPING.

53. *Points to be observed.*

1. Use correct tools, *e.g.*, screwdrivers according to size of screw, correct punches, &c. If this rule is not observed screws get burred, and can only be removed by an artificer.
2. Before attempting to withdraw screwed axis pins, make certain that threads of screw are fully unscrewed.
3. When replacing screwed axis pins do not use force; the threads will engage without using unnecessary pressure. If this rule is not observed the threads (which are extremely fine) will become so burred, that it will be impossible to replace the pin, *e.g.*, cover lock screwed axis pin.
4. When raising the rear cover do not throw it upwards, but lift it. The hinges are liable to strain. Before lowering, see that the lock is correctly in the gun.
5. Before closing down the front cover, see that the feed block is correctly in position, and the front cover catch raised.
6. When removing parts secured by chains, do not tug on the chain, otherwise they get broken, and the part eventually is lost, *e.g.*, outer casing split pin, cork plug, screwed plugs, tripod pins.

7. With reasonable care, defects and breakages in machine guns should be of extremely rare occurrence. They are simply due to neglect of ordinary precautions.

8. Direct hammer blows must never fall on any part of the gun. Wood must always be placed over the part to receive blows from the hammer or mallet.

9. In stripping examinations no time limit will be imposed, in order to avoid damage to the gun by careless handling.

54. *Changing of barrels.*

The necessity of saving water in the barrel casing entirely depends upon prevailing conditions. In tropical countries every drop of water is of value. Again, in action water may not be available, and time may be of the utmost importance. On the other hand, if the gun is being stripped in barracks or billets, there is no necessity to save the water, providing a further supply can easily be obtained.

55. *To change a barrel without losing the water.*

1. Unload.
2. Remove the lock.
3. Remove the outer casing of the muzzle attachment and muzzle cup.
4. Remove the feed block.
5. Remove the fuze spring, and box.
6. Remove the "T" fixing pin and lower the rear crosspiece.
7. Remove the slides, left and right.
8. Remove the elevating joint pin and depress the gun.

Great care must be taken to avoid damage to the direction dial. Order No. 2 to hold a rag or pad over the muzzle, and when the recoiling portions are being withdrawn to follow up the barrel with the pad, in order to close the hole in the front end of the barrel casing. Withdraw the recoiling portions. When replacing a new barrel, the above operations should be reversed. The water may also be saved by allowing it to run from the barrel casing into a receptacle, when the barrel will be changed as above.

56. *Detailed stripping of the gun.*

1. The gun is stripped in the following order, the gun being on the mounting.

NOTE.—Operations marked with an asterisk will only be performed by an armourer.

2. *Lock.*—Unload ; raise the rear cover, pull the crank handle on to the roller ; see that the extractor drops, place the finger between the extractor and stop and lift the lock—at the same time allowing the crank handle to move slowly forward until the lock is released from the side-plates. Give the lock one-sixth turn and lift it out.

3. *Muzzle attachment.*—Withdraw the split pin. Give the outer casing one-sixth turn and remove it. Unscrew the front cone, unscrew and remove the muzzle cup. Unscrew and remove the gland and packing.

4. *Feed block.*—Raise the front cover and lift out.

5. *Fuze spring box.*—With the right hand at the rear and the left hand at the front, press the box forward until clear of the stud, and remove. Disconnect the fuze chain and remove the box and the spring.

6. *Fuzee*.—Turn the fuzee to the rear until the lugs on the stem are free to be withdrawn.

7. *Recoiling portions*.—Raise the rear cover, unscrew the "T" fixing pin, and lower the rear crosspiece; remove the right and left slides, and draw out the recoiling portions. Disconnect the side-plates from the barrel (removing the left one first).

8. *Roller*.—Remove the split fixing pin, collar and roller.

9.* *Check lever*.—Drive out the keeper pin from the under side, and take off the check lever.

10. *Tangent sight*.—Unscrew the axis pin and remove. Remove tangent sight, piston and spring.

11. *Rear cover lock*.—Unscrew the axis pin and remove. Remove the rear cover lock and spring.

12. *Trigger bar*.—Remove the spring and withdraw the trigger bar.

13.* *Front and rear covers*.—Remove the keeper pin and check nut, and force out the joint pin.

14. *Front cover catch*.—To remove the spring and plunger, force the plug inwards, and give a quarter turn by means of a screwdriver, when the plug will be forced out by the spring. Before removing the plunger it must be turned so that the slots are free to pass the lugs in the catch.* If necessary, by taking out the keeper pin, the catch can be taken out.

15.* *Rear crosspiece*.—Remove the keeper pin and check nut, and force out the joint pin.

16.* *Foresight*.—The position of the foresight should first be carefully marked; drive the foresight out of the

dovetail seating through the right-hand opening in the protector.

Remove the gun from the mounting.

17.* *Steam tube*.—Place the gun on end, so that it stands on the rear end of the breech casing. Remove the keeper screw and unscrew the steam tube. (This should not be removed if the valve is free.)

18. *Sliding shutter*.—Press in the catch, and force the shutter to the front until it is against the stop, then press in the plunger with the No. 3 punch, and force the shutter forward until it is clear of the breech casing.

57. To assemble the gun.

1. Reverse all the foregoing operations, with the exception that the recoiling portions must be replaced before the front packing and gland.

2. When assembling the barrel and side-plates, force must not be used. If the side-plates are not home on the barrel trunnions and crank-shaft, the barrel must be withdrawn and the side-plates properly assembled, otherwise burrs on the crank-shaft may occur.

3. When replacing the gland of the muzzle attachment, care must be taken to see that it is screwed right home to the barrel casing. When not home the gland is liable to foul the muzzle cup when the barrel recoils, and thus cause damage to the cup; also loss of gas power will occur, as the initial space between the front cone and the muzzle cup will be increased. The split pin which fixes the outer casing of the attachment to the gland should be placed in the top hole.

4. Care must be taken, when re-assembling the steam tube, that the acorn end is inserted into its seating in the barrel casing.

This is more easily assured by keeping the acorn end in contact with the adjacent channel formed by corrugation of the barrel casing.

The tube should screw home freely when in the correct position.

58. Stripping various component parts.

1. *To strip the lock.*—See that the lock is cocked ; force out the side lever split pin and axis bush ; remove the side levers, the extractor levers and the extractor. Push out the tumbler axis pin and remove. Release the lock spring, push out the trigger axis pin. Remove the trigger, lock spring, firing pin and sear with spring.

2. *To strip the extractor.*—Push out the gib spring cover, and remove the spring and gib.

3. *To assemble the lock.*—Reverse the above, except in the case of the lock spring, which must be forced home, long arm towards the extractor, when the lock is in the fired position, and when all the other parts are assembled.

NOTE.—The firing pin should never be released unless the extractor is up against the top stop.

4. *To strip the feed block.*—Force out the split pin and separate the top and bottom levers ; take out the slide and remove the pawls and spring.

Draw out the bottom pawl axis pin and remove the spring and pawls.

To assemble, reverse the above.

5.* *To strip the rear crosspiece.*—Unscrew the firing lever axis pin, and remove the firing lever with pawl. Unscrew the safety catch axis pin ; remove the safety catch and spring with piston ; lift out the trigger bar lever.

To assemble, reverse the above. See that the pawl engages the trigger bar lever.

6. *To strip the tangent sight.*—Unscrew the axis pin and force it out. Remove the tangent sight, piston and spring.

7.* *To strip the tangent sight slide.*—Remove the upper fixing screw of the graduated plate from the stem, take out the split pin, unscrew the clamping nut and remove the pinion from the slide. In the case of the Mk. II ** slide, remove also the friction spring and washer.

To assemble, reverse the above in each case.

CHAPTER VIII.

SPARE PARTS INSTRUCTION.

59. *General remarks.*

The importance of knowing what is and what is not carried spare should be impressed on all machine gunners. It is essential to know where to find any spare parts that may be required. All spare parts must be given their proper names. A list of deficiencies should be kept inside each box, and the necessity of checking spare parts whenever opportunity offers must be emphasized. Breakages and losses must be reported immediately. Spare parts must be kept slightly oiled.

60. *Method of instruction.*

First lesson.—Object : To describe the spare parts box case and wallet and to teach the correct names of spare parts.

The instructor, having laid out the whole of the contents of the spare parts box, spare parts case and wallet, will teach his squad as follows :—

Holding up each article (in accordance with official list of spare parts) he will call out the correct name given to it. The use of the spare part being dealt with will be explained.

Second lesson.—Object : To teach the proper method of packing.

The instructor will lay out the whole of the spare parts as already described.

The instructor will indicate the numbers on issue and the method of packing each part.

61. *Box, spare parts and tools, Vickers .303-inch M.G. Mk. II.*

These boxes are of wood. The lid is hinged and is secured by means of a spring catch. Carrying strap with handles are provided.

Internally the box is fitted to take the stores enumerated in Sec. 64.

The dimensions of the box are as follows :—

Length overall ...	...	...	...	15 $\frac{1}{2}$ in.
Depth ...	...	...	...	8 „
Width ...	...	...	...	9 $\frac{1}{2}$ „

62. **Case, spare parts and tools, Vickers .303-inch M.G. Mk. I.*

The case is of leather, 8 $\frac{1}{2}$ inches by 5 inches by 4 inches. It contains the wallet and stores enumerated in Sec. 65. It is closed by a lid secured by a strap. A shoulder strap 66 inches long passes round the case through loops at the sides.

63. **Wallet, Vickers .303-inch M.G. Mk. I.*

The wallet is of leather, and when opened out measures 11 $\frac{1}{2}$ inches by 8 $\frac{1}{4}$ inches. It is provided with a double pocket to take the stores enumerated in Sec. 66. When folded it is secured by a strap. The wallet is carried in the spare parts case.

* The case with wallet forms a first-aid gun kit and should always accompany the gun when in action.

64. Contents of spare parts box.

Blocks, feed	2
Boxes, tin for small parts	3
Bushes, axis side levers	1
Cases, spare parts and tools	1*
Collars, roller	1
Cork	1
Cups, muzzle attachment	1
Discs	4
Eyelets, long	oz. 1
Fuzee, with chain	1
Gib	1
Gland, packing	1
Hammer	1
Lever extractor, left	1
" " right	1
Packing, asbestos (5-yd. pieces)	4
Pins, trigger	1
" tumbler	1
" firing	2
" fixing crank handle	1
" split collar roller	2
" " keeper $\frac{1}{2}$ by $2\frac{1}{2}$ (for Mk. IV tripod mounting)	6
" bush axis side lever	1
" check nut long	3
" muzzle attachment	1
" " fixing rear crosspiece	2
Plugs, belt	1†
" cork, complete	1
" screwed	1
" front cover catch	2
Plungers, front cover catch	2
Roller	1
Screws, clamp, checking traverse	1§
Screwdrivers, large	1
Sights, night, back and fore, each	1†

* For contents see "spare parts case."

† Issued and indented for separately; not part of the contents of spare parts box as issued.

‡ In one box only in each limber.

§ In one box only in No. 1 limber of each section.

Sights fore	1
" tangent	1
Spanner, shifting	1
Springs, bottom pawl	1
" cover lock	2
" front cover catch	2
" gib	1
" lock	4
" safety catch with piston	2
" sear	2
" shutter catch	2
" tangent sight	1
" top pawl	2
" trigger bar	2
Strips, long	25
" short	25
Tool repairing belt	1
Wire gauze (pieces)	4
Washers, packing nut elevating (Tripod Mk. IV)	6

65. Contents of spare parts case.

Balance, spring	1
Can, oil	1
Flannelette for binding luting pads yds.	8*
Funnel	1†*
Lock	1
Luting	oz. 6*
Plug, clearing	1
Spring, fusee	1
Tool, combination	1
Wallet	1†

66. Contents of Wallet.

Cork	1
Cap, muzzle	1

* Issued and indented for separately; not part of the contents of the spare parts case as issued.

† Not required when filler and petrol can condenser are provided.

‡ For contents see Wallet.

Disc, muzzle attachment	...	...	...	...	...	1
Fusee, with chain	...	...	...	...	...	1
Gib	...	...	...	...	...	1
Pins, trigger	...	...	...	...	...	1
„ tumbler	...	...	...	...	...	1
„ firing	...	...	...	...	...	1
„ split keeper, $\frac{1}{8} \times 2\frac{1}{4}$ in. (for Mk. IV tripod mounting)	...	...	...	...	...	3
Pliers, cutting pairs	...	...	...	...	...	1
Protector muzzle	...	...	...	...	...	1
Pull-throughs, double	...	...	...	...	...	1
Punches, No. 3	...	...	...	...	...	1
„ No. 5	...	...	...	...	...	1*
Reflector mirror	...	...	...	...	...	1
Screwdrivers, small	...	...	...	...	...	1
Sear, with spring	...	...	...	...	...	1
Spring, gib	...	...	...	...	...	1
„ lock	...	...	...	...	...	2
Trigger	...	...	...	...	...	1
Tumbler	...	...	...	...	...	1
Washers, adjusting No. 1 .003 in.	...	...	...	...	...	3
„ „ No. 2 .005 in.	...	...	...	...	...	3

* Issued and indented for separately; not part of the contents of the spare parts case as issued.

CHAPTER IX.

IMMEDIATE ACTION.

67. General remarks.

1. *Definition.*—The automatic application of a probable remedy for the stoppage, based on the position of the crank handle.

2. It is essential that all the kit required is at hand.

3. The various immediate actions necessary to remedy temporary stoppages are denoted by the position of the crank handle, which may stop in one of four positions, known as the first, second, third, or fourth position.

4. The stoppage should be set up as described in Chapter X.

5. While stoppage is being set up, the firer should be seated on the ground, behind the gun, with his head turned aside, and on the removal of the covering from the crank handle he should perform the immediate action.

6. The instructor must not deal with the causes of stoppages during the first stages of instruction in immediate action.

7. The instructor must insist on correct reloading and relaying.

8. As proficiency is attained, training should be carried out in darkness, or with No. 1 blindfolded.

9. To afford training in immediate action, each stoppage should be set up as if the gun had stopped during the actual firing.

10. Whenever a temporary stoppage necessitates the use of a spare lock, &c., the part which has been removed

should be repaired and returned to the gun as soon as possible.

11. Immediate action is not complete until the gun has been relayed and fired. A target must always be indicated at the beginning of the lesson.

12. After the immediate action has been completed, the instructor should check the aim and criticise any errors.

13. The rear cover should never be opened nor closed with the lock home or at the tangent sight raised.

14. If the lock cannot be drawn back, open the front cover and force down the extractor.

15. The rear and front covers, when lowered, must always be fastened correctly.

16. A lock must never be changed with cartridges on the face of the extractor.

17. Should it be necessary to release the lock spring with the lock out of the gun, this should be done with the extractor held right up, so that the firing pin hole is opposite the firing pin.

68. *Method of instruction.*

The following table of temporary stoppages set out under five columns gives a clear indication of the method to be employed in teaching the practical side of the mechanism. Column I shows the four positions of the crank handle when the gun stops firing. The first three positions may vary slightly. These positions, which afford a ready indication of the correct "Immediate action" to be performed, must be recognized clearly before the instruction proceeds. They should be demonstrated at the beginning of instruction.

At this stage the squad should not be required to know what these four positions indicate. It will be explained

later, when the probable causes of the stoppages are being taught.

Column 2 gives a detailed description of the "Immediate action" to be performed by the firer (sometimes with the assistance of No. 2) as soon as the position of the crank handle has been recognized after the gun has stopped firing.


Column 3 deals with the probable causes of these stoppages, but it is of first importance that the instructor does not proceed to this stage until he is assured that every "Immediate action" can be correctly and immediately carried out without the slightest hesitation or forethought.

A thorough knowledge of the causes of temporary stoppages will not only give the squad a practical knowledge of the working of the gun, but will also be a help in the discovery of the cause of any unusual stoppage which may occur.


In Column 4 is given the method for preventing the recurrence of certain stoppages, the causes of which may only be temporarily cured by the immediate action. It will sometimes be possible to carry out these remedies in two or three minutes; at other times their execution may cause the gun to be out of action for a longer period; but, in either case, no skilled assistance or special appliances, other than those carried with the machine gun section, will be required.

Column 5 shows how the various temporary stoppages can be simulated for instructional purposes. It is unnecessary to teach these methods of preparation to the machine gunner, but every instructor must have a thorough knowledge of this column in order to teach the correct "Immediate action" for any temporary stoppage.

TEMPORARY STOPPAGES.

Position of Crank Handle.	Immediate Action.	Probable Cause.	Prevention of Recurrence.	Method of Preparation.
I. 	(i) Pull the crank handle on to the roller, pull the belt to the left front, and let go the crank handle. (ii) If, after carrying out (i), the crank handle stops in the same position when going forward, pull crank handle on to roller, open the rear cover, clear the face of the extractor, change the lock and reload. (iii) If failure recurs, repeat (i) and lighten fuzee spring by 3 "clicks."	The extractor has not dropped. This may be due to:—(i) Weak charge. (ii) Weak or broken gib spring. (iii) Too heavy fuzee spring. (b) Want of oil in working parts. (c) Grit in working parts. (d) Excessive packing. (e) Worn barrel. (f) Tight pockets. (g) Friction due to frozen oil or water.	(i) Attend to points before and during firing.	Perform half the loading motions; pull the crank handle slowly back until the horns of the extractor have engaged with the steps of the cams; let go crank handle and pull the belt to the left front. <i>Note.</i> —In all cases except where the stoppage is caused by a weak charge the preparation must be repeated. To set up a stoppage caused by a weak or broken gib spring, perform half the loading motions; open the rear cover, withdraw and lift up the lock. Slide the cartridge

Indication.—The lock is unable to come back far enough to allow the extractor to drop.

II. 	(i) Force the crank handle to the rear and call out "Clearing Plug," open the rear cover, lift up lock and examine the cartridge on the face of the extractor. If a damaged cartridge, or an undamaged cartridge with the front portion of a separated case adhering to it is found, call out "don't want it," clear the face of the extractor and reload.	(i) (a) Damaged cartridge. (b) Separated case with front portion withdrawn tele-scooped on undamaged cartridge.	(i) (b) and (ii)—If a succession of separated cases occurs the connecting rod must be lengthened if a change of lock effects no improvement.	on the face of the extractor half-way down the lower portion of the gib, replace the lock and pull the belt to the left front. <i>For Range Purposes.</i> —Increase the weight of the fuzee spring. (i) (a) Insert a bulged dummy cartridge as the first cartridge in the belt, and load. <i>For Range Purposes.</i> —Place a bulged dummy cartridge in the belt. (b) Perform half the loading motions. Open the rear cover, withdraw and lift up the lock. Place the front portion of a separated case securely over the bullet of the cartridge on the extractor. Replace the lock, close the
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Indication.—The lock is unable to go fully home after recoil.

TEMPORARY STOPPAGES—*continued.*

Position of Crank Handle.	Immediate Action.	Probable Cause.	Prevention of Recurrence.	Method of Preparation.
II.— <i>continued.</i>	(ii) If an undamaged cartridge, with no front portion of separated case adhering to it is found on the extractor, clear the face of the extractor, replace the lock, keeping the crank handle on the roller. Take the clearing plug (seeing that the centre pin is back) and insert it into the chamber. Push the	(ii) Separated case. Front portion remaining in chamber.		rear cover, pull the belt, and let the crank handle go slowly forward. <i>Note.</i> —Another method is to use a dummy with the front portion of a separated case soldered on it. (ii) Perform half the loading motions, raise rear cover and lift out lock; place the front portion of a separated case lightly over the bullet of the round on the extractor and allow the lock to go slowly forward, ensuring that the separation will remain in the chamber. Close rear

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III.



Indication.—The extractor is unable to rise to its highest position.
If the feed block slide is jammed, there is a fault in feed.

allowing the lock to go forward slowly, keep a firm pressure on the crank handle, give the clearing plug a rocking motion; withdraw the lock; strike back the handle of the clearing plug and withdraw it (seeing that the front portion of the separated case is on the clearing plug) and reload.
(i) Slightly raise the crank handle, pull the belt to the left front, let go the crank handle and then strike it down on the check lever.

(i) Slightly raise the crank handle, pull the belt to the left front, let go the crank handle and then strike it down on the check lever.

(i) A cartridge is fed up slightly crosswise.

(i) Examine cartridges in belt.

(i) Perform half the loading motions, then pull the crank handle on to the roller and raise the rear cover; pull the belt just sufficient to move a cartridge half-way into the face of the feed block. Allow crank handle to go slowly forward so that it will remain in the third position, and lower the rear cover.

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cover and pull belt to the left front.
For Range Purposes.—File a cartridge about one inch from the base, and insert in the belt. Care must be taken that the cartridge is not filed too far through, as there is danger of the bullet being left in the barrel.

TEMPORARY STOPPAGES—continued.

Position of Crank Handle.	Immediate Action.	Probable Cause.	Prevention of Recurrence.	Method of Preparation.
III.—continued.	(ii) If the stoppage recurs, repeat the immediate action, unload, oil the working parts, and reload.	(ii) Friction in lock, &c.	(ii) Attend to points during firing.	(ii) Proceed to load, but crank handle must be eased forward the second time in order that it may remain in the third position. <i>Note.</i> —In the case of a stoppage due to friction, the preparation must be repeated.
	(iii) If (i) fails, examine feed block slide. If jammed, No. 1 calls out "feed block," pulls the crank handle on to the roller,* raises the rear cover and hangs the lock. No. 1 then draws back the recoiling portions while No. 2 depresses the	(iii) (a) Bent or damaged long brass strip. (b) Badly-filled belt. (c) Worn or loose belt pockets. (d) Belt box not in line with the feed block.	(iii) Attend to before and during firing. <i>Note.</i> —Badly filled belts are the chief cause of stoppages in the third position.	(iii) Pull out the fourth cartridge in the belt about half an inch. Perform half the loading motions; pull the crank handle slowly back until the horns of the extractor have engaged with the steps on the cam. Draw the

	(iv) If slide is free, No. 1 calls out "Extractor," and opens the front cover. No. 2 forces down the horns of the extractor. No. 1 clears the face of the extractor. No. 2 depresses the pawls, withdraws the	(iv) Thick rimmed cartridge.		recoiling portions to the rear by forcing the knob of the crank handle forward, and the tail to the rear, at the same time pulling the belt to the left. Bring the crank handle on to the roller and ease forward.
				<i>For Range Purposes.</i> —Fill a belt badly, or bend a long brass strip, or place the box at an angle to the feed block.
				(iv) Place a dummy with a thick rim as second cartridge in the belt. Proceed to load easing crank handle forward second time. <i>For Range Purposes.</i> —Damage

* In order to do this, it may sometimes be necessary for No. 2 to force down the horns of the extractor.

Position of Crank Handle.	Immediate Action.	Probable Cause.	Prevention of Recurrence.	Method of Preparation.
	belt and remove the first cartridge in the belt, and then No. 1 closes and locks the front cover and reloads.			the rim of a dummy cartridge, and place it in the belt. <i>Notes—</i> (1) A special dummy can be used, having a thin washer soldered on to the base. (2) This stoppage should seldom be practised on the range, since the thickened rim may damage the grooves of the extractor.
IV.	(i) Pull the crank handle on to the roller, pull the belt to the left front and let go the crank handle. (ii) If (i) fails, pull crank handle on to the roller twice, change lock and reload.	(i) Defective ammunition. (ii) (a) Broken or damaged firing pin. (b) Broken		(i) Load. Press thumb-piece. <i>For Range Purposes.</i> —Insert a dummy in the belt. (ii) Load and press thumb-piece, and on No. 1 applying the



Indication.—There has been no ex-

there has been little or no recoil, the lock remaining in its forward position.

(iii) If when performing (i), No. 1 notices that more belt than usual comes through to the left, he performs the second half of the loading motions.	(iii) Empty pocket in the belt.	(iii) Inspect belts.		action, instructor says "Gun will not fire." <i>For Range Purposes.</i> —Insert two dummies in the belt. (iii) Press thumb-piece. Insert belt in feed block until first cartridge is in line with finger-piece of bottom pawls. <i>For Range Purposes.</i> —Leave a space in the belt.
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Note.—Worn or damaged side or extractor levers may result in the extractor being unable to rise, or, if the side levers are bent, there may be either a succession of separated cases, or the lock may become jammed.

CHAPTER X.

STOPPAGES.

69. Classification.

Stoppages in the automatic action of the gun may be classed under two main headings:—

i. Temporary—which are due to:—

- (a) Failure of some part of the gun of which a spare is carried.
- (b) Faulty ammunition.
- (c) Neglect of points before or during firing.
- (d) Ignorance on part of the gun team.

ii. Prolonged—which are due to failure of some part which cannot, as a rule, be put right by the team under fire or without skilled assistance. These necessarily put the gun out of action for a more or less prolonged period.

On the knowledge and training of the team depends the rapidity with which "temporary" stoppages can be overcome.

70. Preparation of stoppages for instructional purposes.

In order that the men may attain a high standard of training in dealing with stoppages, it is essential that the instructor should prepare the stoppages accurately in order that the correct immediate action may be applied by the No. 1.

71. General instructions.

1. Setting up stoppages should not be taught to the private soldier, unless he is likely to become an instructor.

2. The squad should be seated on the right side of the gun, so that the crank handle may be visible and the actions of the instructor more clearly seen.

3. The instructor should detail a member of his squad to perform the immediate action for each stoppage when prepared.

4. A target will be indicated to the squad at the beginning of instruction.

Kit required.

- (i) Gun and tripod.
- (ii) Belt and dummy cartridges.
- (iii) Bulged dummy.
- (iv) Dummy cartridge with prepared thick rim.
- (v) Front portion of a separated case and telescoped separation.
- (vi) Spare parts case.
- (vii) Covering for crank handle.
- (viii) An aiming mark.

72. Stoppages not included in I.A. table and preparation for instructional purposes.

1. The causes of prolonged stoppages are so varied that they cannot be set out in detail. The following are, however, of importance, and should be known by all men of the section.

2. *Parts of the lock damaged* (no spare parts being available).—The gun will fire single shots without sear or, if the bents of the sear or firing pin are badly worn or broken off, but this can only be done by pressing and releasing the thumb-piece quickly.

The gun will also fire "rapid" without the sear, but only for a short period, when the firing pin will probably be broken.

The gun will fire if the nose of the trigger or bent of the tumbler is badly worn or broken off, but the firing cannot be controlled by the thumb-piece. In this case the gun will fire the instant the crank handle reaches the check lever, although the thumb-piece has not been pressed or, if the defect occurs during firing, the gun will not cease firing when pressure on the thumb-piece has been released. To remedy this, firing should be stopped by throwing the filled end of the belt over the breech casing to the left. If this results in a third position stoppage, No. 1 will hold the crank handle in his right hand and open the front cover. No. 2 will press down the horns of the extractor. No. 1 will then close the front cover and pull the crank handle on to the roller, while No. 2 will remove the belt from the feed block, until the first round is level with the belt box. No. 1 will then let the crank handle fly forward on to the check lever, to fire the round on the face of the extractor. The lock can now be changed with safety. On no account should the crank handle be allowed to fly forward until the belt has been removed from the feed block.

If a fourth position stoppage is the result, No. 2 will remove the belt as before. No. 1 will then pull the crank handle on to the roller, and allow it to fly forward

on the check lever, when the live round, which may be on the face of the extractor, will be fired.

The lock can now be changed with safety.

If no spare lock is available the gun can be worked as follows:—

- (a) Group the cartridges in the belt, say 20 or 30 rounds in each group.
- (b) Lay the gun before commencing to load, pull the crank handle on to the roller, pull the belt to the left and let the crank handle go; repeat, but, before allowing the crank handle to reach the check lever and the gun to fire, grip the rear crosspiece with the left hand, to control the gun in the ordinary way.

Preparation.—Give the order "Load." As soon as the crank handle touches the check lever for the second time, say "Gun Firing." Or, if it is desirable to simulate this happening during firing, after the command "Cease Fire," and directly No. 1 releases his pressure from the thumb-piece, say "Gun still firing." Damaged cartridge grooves, broken gib spring or broken gib will give a No. 3 stoppage.

If after applying the immediate action for a thick rim cartridge the stoppage recurs on reloading, repeat the immediate action and change the lock.

A broken gib spring may also give a No. 1 stoppage.

Preparation.—Two thick rimmed cartridges will be placed as second and third rounds in the belt.

3. *Broken fuze spring or fuze.*—The gun will stop firing and the crank handle will be found to be resting on the roller.

To remedy proceed as follows :—

Return the crank handle to the check lever, remove the fuzee spring box and spring. Remove the spring from the adjusting screw. (If fuzee is broken remove it from its seating.) Reassemble new spring or fuzee, replace fuzee spring and box, reload, relay and open fire.

Preparation.—Perform half loading motions. Remove fuzee spring box and spring. Replace fuzee spring box with spring detached from the fuzee. Pull crank handle on to the roller, pull belt to the left front.

4. *Muzzle attachment.*—In case of any damage to the muzzle attachment, necessitating its removal, it is necessary to reduce the weight of the fuzee spring to about two to three pounds.

73. Summary of causes of stoppages.

First position ...	Weak charge. Weak or broken gib spring. *Too heavy fuzee spring. *Want of oil, or grit in working parts. *Excessive packing. *Worn barrel. *Tight pockets in belt. *Friction due to frozen oil or water.
Second ...	Damaged cartridge. Separated case.
Third ...	Cross-fed cartridge. *Friction on lock.

* See note at end of Section 73.

Bent long brass strip.
Badly-filled belt.
Torn or worn belt.
Loose pockets in belt.
Belt box not in line with feed block.
Thick rimmed cartridge.

Fourth ...	Defective ammunition. Broken or damaged firing pin. Broken lock spring. Empty pocket in belt.
Special ...	Broken muzzle cup. Broken fuzee spring. Nose of trigger or bent of tumbler worn or broken. Damaged cartridge grooves. Broken gib spring. Broken gib.

NOTE.—Recurring stoppages are starred thus*.

CHAPTER XI.

EXAMINATION OF MACHINE GUNS, TRIPODS, &c.

74. General remarks.

1. It is important that not only should machine guns &c., be examined when first taken over, but examination of guns and tripods is frequently necessary. The gun and tripod should be examined daily, as stated in "Care and Cleaning," Chapter VI, and a more detailed examination should be made occasionally, as required.

2. *Kit required.*—(1) Gun and tripod. (2) Spare parts complete. (3) Spare barrel. (4) Belt boxes and belts.

75. Method of instruction.

The methods and sequence of instruction will be the same as for all other subjects, whenever the sub-head being dealt with permits.

76. Points for examination.

1. *Muzzle attachment* (outer casing).—Disc clean and in good condition, free from burrs and fouling.

2. *Muzzle cup.*—(i) Clean and free from rust. (ii) No sign of flaws.

3. *Foresight.*—Blade in good condition.

4. *Steam tube.*—(i) Keeper screw in correct position. (ii) Free movement of the slide valve. This can be ascertained by giving the gun a rocking motion, when the movement of the valve should be distinctly heard.

5. *Front cover catch.*—See that it works correctly.

6. *Tangent sight.*—(i) Aperture of fixed sight on stem and pillar and aperture of the slide in good condition. (ii) Free working of the slide. (iii) Top and bottom screws securely fixed.

7. *Rear cover lock.*—(i) Automatic fastening of the rear cover when lowered. (ii) Cover lock screwed axis fully screwed home.

8. *Safety catch.*—Automatic action of spring and catch.

9. *Firing lever.*—(i) See that the firing lever cannot be pressed home unless the safety catch is raised. (ii) See that the trigger is released before the firing lever bears against the stop on the safety catch, when the latter is raised.

10. *Trigger bar and spring.*—See that the spring sends the trigger bar forward quickly. Inspect trigger bar for roughness and burrs.

11. *Fuzee spring and fuzee.*—(i) Claws of spring in good condition. (ii) Threads of the adjusting screw in good order. (iii) Vice pin not bent. (iv) Correct weight. To weigh and adjust, see "Repairs and Adjustments," Chapter XII. (v) Fuzee and chain in good condition.

12. *Recoiling portions.*—Remove fuzee spring, and work the recoiling portions backwards and forwards; if the recoiling portions move freely (for weight, see

"Repairs and Adjustments," Chapter XII) they are correct. If not, look for the following :—

- i. Too tight packing.
- ii. Dented side of the breech casing and consequent bearing on the side-plates.
- iii. Slightly bent or damaged side-plates.

13. *Connecting rod*.—Examine as detailed in "Repairs and Adjustments," Chapter XII.

14. *Lock*.—

- i. *Side and extractor levers*.—(i) Remove feed block and keep the front cover raised. (ii) Draw back the crank handle, and let it go slowly forward on to the check lever. (iii) If correct the extractor should now be in its highest position.
- ii. *Bents of sear and firing pin*.—(i) Pull crank handle on to roller. (ii) Press the thumb-piece and while maintaining pressure, let the crank handle go slowly forward on to the check lever. (iii) The extractor should be kept up to its highest point before the sear releases the firing pin.
- iii. *Extractor*.—(i) Remove lock. (ii) Examine the face for burrs and flaws. (iii) Try the groove with the armourer's dummy to see if the cartridge would be held horizontally.
- iv. *Nose of trigger and bent of tumbler*.—(i) Cock the lock. (ii) Release the sear; the firing pin should now be held back.
- v. *Firing pin*.—See that the point is not broken. A broken firing pin can be recognized without stripping the lock by releasing the lock spring

with the extractor up. If correct the firing pin will then protrude from the firing pin hole, and can be withdrawn by raising the tail of the tumbler. If it does not protrude, or, if protruding, the point is not withdrawn when the tail of the tumbler is raised some part of the firing pin is broken.

- vi. *Lock spring*.—Test weight as follows :—(i) Fully cock the lock. (ii) Place bottom of the lock on a flat surface. (iii) Place the loop of the spring balance over the side lever head and left hand on the top of the lock. (iv) Draw the side lever head upwards with the spring balance, when the balance should record from 12 to 14 lb.

15. *Feed block*.—(i) Examine the stud for burrs and flaws. (ii) Split keeper pin in position. (iii) Free work of the slide. (iv) Pawls and pawl spring in good condition. (v) Cartridge guides not burred.

16. *Sliding shutter*.—(i) The sliding shutter should not require any undue effort to move it by hand. If it does, look for :—

- (a) Dirt or grit.
- (b) Dented bottom plate, probably due to the dropping of the connecting rod on it when the lock is out of the gun.

(c) See that the catch and spring work automatically.

17. *Barrel*.—For daily examination, use the mirror reflector, but the only certain way is to examine the barrel with the naked eye. The barrel should be carefully examined for rust, cuts, erosion, nickelling, and wear and bulges. Proceed as follows :—

- i. Remove the barrel from the gun.
- ii. First with the eye close to the breech, then with eye some inches back from the breech, examine the bore, rotating the barrel slowly. Carefully examine the lead to see if undue erosion has taken place.
- iii. The barrel should now be reversed and examined carefully from muzzle end in a similar manner.

18. *Packing*.—Fill the barrel casing with sufficient water to cover the barrel and work the recoiling portions; there should be no leakage.

19. *Axis pins, &c.*—See that all the axis pins are correct; also the chains securing the component parts.

20. *Tripod*.—(i) Chains correct. (ii) Jamming handle neither bent nor fouling the elevation dial when the all-round traverse is performed. (iii) Elevating gear not too loose. (iv) Centreing blocks fixed. (v) Crosshead arm fitting the gun.

21. *Spare parts*.—See if correct in number and condition.

22. *Belt boxes and belts*.—

- (i) *Belt boxes of wooden pattern*.—(a) Clean and undamaged. (b) Catches correct. (c) Carrying straps secure.
- (ii) *Belt boxes, metal pattern*.—(a) Clean and undamaged. (b) Release strap secure. (c) Carrying handle correct.
- (iii) *Belts*.—(a) Clean. (b) Brass strips correct. (c) Not torn or frayed.

CHAPTER XII.

REPAIRS AND ADJUSTMENTS.

77. *General remarks.*

1. It is necessary that all machine gunners should be able to carry out any of the minor repairs enumerated below. Artificers' services are not always available at a critical moment, and the maintenance of a gun in action under such circumstances entirely depends on the ability of a gunner to carry out minor repairs.

Whenever possible, the subject must be taught in the same method and sequence as other subjects.

2. *Kit required*.—Gun and tripod. Spare parts box complete. Parts of an old belt.

78. *Instructions for fitting spare discs for the muzzle attachment.*

Unscrew the front cone. Cut the edge of the disc, driving sufficient metal up to provide a hold for the pliers. Remove the disc and replace it with a new one. In replacing, it may be necessary to tap the disc on to the front cone.

79. *Instructions for lateral adjustment of the foresight.*

1. This will only be carried out by an experienced N.C.O.

2. It will not be carried out on the 30 yards range.

3. *Target*.—Any target with a thick vertical line as an aiming mark with a pencil line $\frac{1}{8}$ ths of an inch to the right of the centre of the thick line. The latter will be invisible to the firer.

4. Settling bursts will first be fired. Then a group of 10 rounds will be fired by inserting the No. 3 punch between the firing lever and safety catch. If the gun is sighted correctly the mean point of impact will be on the thin pencil line, *i.e.* $\frac{1}{8}$ ths of an inch to the right of the point aimed at.

If there is any lateral error the foresight will be tapped in the same direction as the error using the No. 3 punch and a hammer.

Another burst of 10 rounds will be fired after each adjustment until the sighting is correct. Adjustments are very fine and great care must be exercised in tapping the foresight. When the foresight is very tight the bracket should be supported to prevent it from jarring loose.

5. It is important that the socket of the tripod should be perfectly upright. After each group is fired the aim must be carefully checked to see that the tripod has not moved.

80. Perforation of the barrel casing.

1. In the event of the barrel casing being pierced by bullets, &c., the gun being thus out of action, repairs will be carried out locally in accordance with the following methods, to enable the gun again to take its place in the firing line with the least possible delay :—

(i) Temporary " first aid " repairs to be carried out by the gun team.

(ii) Semi-permanent repair to be carried out by an armourer when opportunity occurs.

2. To effect (i) a pad of luting, preferably wrapped in a piece of flannelette or cloth to prevent it from being squeezed through the hole or holes, is pressed over the latter and covered with an oiled pad of flannelette. The whole is then bound round with flannelette, folded in two to increase its strength, the flannelette being tied to make it fast. This, whilst not preventing leakage entirely, should do so sufficiently to enable the gun to be kept fit for action.

The methods described will not remedy the defect when there is a hole in the end cup into which the tubular portion of the casing is screwed.

3. The following stores are supplied to enable the repair at (1) to be carried out :—

Luting (in tin boxes)	oz. 6	} For each gun, to be carried in the spare parts case.
Flannelette, 4-in. wide	yds. 8	

81. Instructions for weighing and adjusting the fuzees spring.

With the spring balance, proceed as follows: Take out the lock, place the loop of the spring balance over the knob of the crank handle, and, standing on the left side of the gun, press down the check lever with the left hand. Pull the balance vertically upwards, resting the wrist on the breech casing; the reading indicated, when the crank handle begins to move, will be the weight of the fuzees spring. This weight should be between 7 and

9 lb. If the spring is over or not up to weight, adjust by means of the vice pin; generally six clicks (three revolutions) make a difference of about 1 lb. Turning the vice pin upwards decreases the weight, and *vice versa*. The tension of the fuzee spring should always be kept as high as possible, consistent with maintaining the normal rate of fire of 500 rounds a minute.

82. *Instructions for weighing the recoiling portions.*

- (1) Remove the fuzee spring.
- (2) Place the crank handle nearly vertical.
- (3) Place loop of spring balance over the right end of the crank shaft and pull slowly to the rear.
- (4) Weight should not exceed 4 lb.

83. *Instructions for adjusting the length of the connecting rod to be carried out by gun numbers.*

(1) If a succession of separated cases occur on service during actual firing, the lock should be changed, and if still no satisfactory result is obtained, the Nos. 1 and 2 washers should be placed over the adjusting nut as a temporary measure.

(2) The adjustment of the connecting rod should be effected in action by two washers, but subsequently when time permits, single washers should be used, if necessary, to secure fine adjustments.

(3) At the earliest opportunity the guns should be handed to the armourer for testing and adjusting the length to his .064-in. gauge.

Note.—As the gun lock and the spare lock may vary somewhat in length, the longer of the two should be

adjusted as close as possible in order to avoid separated cases when the shorter is taken into use.

84. *Instructions for the renewal of packing.*

1. To renew the packing at the breech end of the barrel. Should the gun leak at the breech, empty the barrel casing. Draw out the recoiling portions. Wind a strand of asbestos (part of a 5 yds. piece) in the cannellure of the barrel, pressing it together with a thin piece of wood or the point of a screwdriver or knife, until the cannellure is full, then oil the asbestos, smooth it down flush with the barrel and reassemble the parts.

2. To renew the packing at the muzzle end of the barrel. Should the gun leak at the muzzle, stand the gun on the rear crosspiece, remove the muzzle attachment and unscrew the gland. Repack, or, if necessary, replace the asbestos, having first oiled it, by winding it loosely round the barrel, and whilst winding, push it in with punch No. 3, a piece of wood, or any blunt-ended instrument which will fit; screw on the gland, as tightly as can be done by hand, return the gun to a horizontal position, hang the lock, and work the recoiling portions backwards to ensure that they move freely. If the packing is found to press too hard on the barrel, the gland should be removed and one or two strands taken out of the asbestos. Finally see that the gland is screwed firmly home to the barrel casing.

85. *Lock repairs.*

To replace any part of the lock, the ordinary sequence for stripping the lock must be followed, until the required part is reached.

In the case of a lock spring, where the broken portions fall clear, a new lock spring may be assembled without stripping the lock.

When replacing parts other than the extractor, gib or gib spring, the extractor need not be removed.

86. *Instructions for use of the tool for repairing belts.*

Remove the damaged strips and eyelets. If a long strip requires fitting, first join the two faces of the strip as follows. Place an eyelet in the hole of the dished end. Insert the punch of the tool into the unopened end of the eyelet, the opened end to rest upon the die, and gently press the handles together. Then put the punch in the other end of the eyelet, and press the handles. Keep the strip horizontal, move the handles of the tool backwards and forwards in a circular direction, with the punch of the tool as the centre, so as to shape the head of the eyelet.

Put the strips into position on the belt, insert the eyelet, and repeat the above operation.

Short strips are fitted in a similar manner, except that they do not require to be joined at one end previous to their being placed on the belt.

Care must be taken to press the eyelets as far through the strips as possible before using the tool.

87. *To repair a torn belt.*

If badly torn, cut out the torn portion, and sew or rivet together the good ends, and cover with the brass strips. The cutting of the belt should be done in such a manner as to ensure that the repair to the top portion of the webbing does not coincide with the repair to the bottom portion.

CHAPTER XIII.

WAGON, LIMBERED, G.S.—{FORE (MARK I).
 {HIND (MARK II).

PLATE XII.

88. *Description.*

The wagon consists of fore and hind portions, connected by a perch, mounted on wheels, 2nd class C, No. 200A. A certain number of wagons have been issued with 2nd class C, No. 43, and some with No. 198A wheels.

The fore portion consists of a framework, fitted with side and front boards and a hinged tail board, a limber hook, No. 41, a 2nd class C axletree, No. 141, and the following draught fittings:—

Pole, draught, No. 17, Mark III.

Bar, supporting draught pole, No. 3, Mark III.

Swingletrees, No. 13, Mark I.

Two lockers—one fitted to carry spare parts, &c., as shown in the table below—and one to carry two lamps are attached outside the near side board. Two clips for the carriage of a rifle in canvas cover are fitted to the front board and two on the off side board.

A pair of lamps and holders are provided as wagon accessories to the fore portion.

The hind portion is generally similar to the fore, but it has no locker, or clips for rifles, is fitted with a removable perch (in place of fittings for draught) and a

brake which is applied from the rear and acts on the front of the wheels. A "Lamp, vehicle rear" is provided as an accessory.

Fittings (with suitable lashings) are provided on the perch and front board to carry a spare wheel, and under the wagon to enable a spare pole (No. 18) to be carried.

Both portions are provided with a canvas cover.

89. Packing.

The wagon is fitted to carry the following spare and wagon equipment stores.

Stores	Fore	Hind	Where carried
Grease, lubricating (in grease box) lb.	3	3	Off side.
Spanner, No. 293*	—	1	
Blocks, brake, field and transport (spare)	2	—	
Board, inventory, wood	1	—	In small stores locker near side.
Bolt, connecting, Nos. 21 and 34 brake screws	1	—	
Collar, adjusting, 2nd class C capped wheels	1	—	
Collar, adjusting, 2nd class C capped wheels (spare)	1	—	
Screwdriver, G.S., 6-inch	1	—	
Hammer, claw, 16 or 14-oz.	1	—	
Pincers, carpenters' pair	1	—	
Pins, lynch, 2nd class C capped wheels (spare)	1	—	
Spanner, adjustable, 11-inch	1	—	
Washer, drag, 2nd class C capped wheels (spare)	1	—	
Brush, water, carriage	1	—	Near side.
Buckets, water, canvas	2	—	Under.
Cordage, spun yarn, hemp, tarred, 3-thread	5	—	Near side.
Ropes, drag, light, G.S. pair	1	—	On perch.
Valise, horse shoes	(1)	—	As convenient.

* Component of wagon. Wagons provided with No. 43 wheels carry a No. 93 spanner.

90. Dimensions, Weights, &c.

The following are the dimensions, weights, &c.:—

Fore and hind portions limbered up—	ft. in.
Length overall—with pole	22 10
without pole	13 9
Height	4 8
Width	6 4
Track	5 2
Distance between axletrees	7 10 $\frac{1}{2}$
Diameter of turning circles	25 8 $\frac{1}{2}$
Angle of lock	85-75 degrees.
Floor space, each portion	4 ft. by 3 ft. 4 in.

Fore portion—	ft. in.
Length—with pole	13 11
without pole	4 10

Hind portion—	
Length—with perch	9 1
without perch	5 4

Wheel, 2nd class C, No. 200A., Mark 1—	
Diameter	4 8
Width of tire	0 2 $\frac{1}{2}$

Weights without cover and spare parts—	cwt.	qr.	lb.
Fore portion	6	1	14
Hind portion	6	1	7

Tonnage for shipment—	Tons.
Fore and hind portions without wheels, pole and perch	4.201
Wheels, No. 200A	1.458
Pole	.032
Perch	.017

Boat transport—

Dimensions—13 ft. 5 in. by 6 ft. 4 in. by 4 ft. 8 in.

Tonnage 9.913

COVERS.

The covers, for both "Fore" and "Hind," are of waterproof canvas, $77\frac{1}{2}$ in. by $69\frac{1}{2}$ in.; they are secured to the wagon by 2 lines on each side and straps at the corners.

Weight each ... 9 lbs. 11 ozs.

WHEEL, 2ND CLASS "C" No. 200A.

The wagon is now equipped with this wheel, which is 4 ft. 8 in. in diameter, of single-spoke construction with a $2\frac{1}{2}$ -in. tyre. The nave consists of outer and inner flanges of steel and a phosphor bronze pipe box. The outer end of the outer flange is screw-threaded for the reception of a No. 2 dust cap and formed with a shoulder for a drag washer. The two flanges are connected by 12 nave bolts which pass between the feet of the spokes. The spokes are 12 in number and are tongued into the felloes.

Weight ... 1 cwt. 2 qr. 15 lb.

Wagons of early issue were equipped with Nos. 198 or 198A wheels, which differ from the No. 200A principally in being of lighter construction and in having the spokes secured to the felloes by steel sockets. The No. 198A wheel differs from the No. 198 in having stronger spokes and felloes.

Certain wagons may be found equipped with the No. 43 wheel, which differs from the No. 200A in being heavier of the double-spoke construction, and in having a 3-in. tyre.

CHAPTER XIV.

PACKSADDLERY.

91. *General remarks.*

1. It is desirable that animals for machine gun packsaddlery purposes should be carefully selected. Those with abnormally broad hips, or with the points of the hips very prominent, should not be chosen.

2. There are two methods of carriage on packsaddles for this machine gun :—

1. When used with cavalry.

2. When used with infantry.

In both methods the sets of packsaddlery comprise certain articles of general service packsaddlery, supplemented by other articles of machine gun packsaddlery, either common to both methods of carriage, or special to either.

3. The composition of cavalry or infantry sets are as shown in the tables which follow; those for infantry show the requirements when all the equipment is carried on pack, as also when the normal method of carriage is in limbered wagons with a certain percentage of packsaddlery for emergency carriage.

4. A description of the articles comprising the several sets, as also instructions for assembling and loading, are given.

92. Detail of Cavalry Sets.

Description	Number of each		
	Gun set	1st Ammunition set	2nd Ammunition set
SECTION J.			
Ropes, head, hemp, Mark IV ...	1	1	1
SECTION D. I.			
Bits, bridoon, P.G.S. ...	1	1	1
Breechings, P.G.S., Mark V ...	1	1	1
Caps, shovel, Mark II* ...	—	2	2
Carriers, water can and condenser ...	—	1	—
Cases, horseshoe, P.M.G., modified ...	1	1	1
Collars, breast, P.G.S., Mark V ...	1	1	1
Collars, head, P.G.S., Mark IV ...	1	1	1
Cruppers, P.G.S., Mark V ...	1	1	1
Girths, P.G.S., Mark V ...	2	2	2
Girths, leather ...	—	1	1
Hangers, gun, sling, cavalry ...	1	—	—
Hangers, tripod, sling, cavalry ...	1	—	—
Pannels, P.G.S., Mark V pairs ...	1	1	1
Racks, boxes, belt, ammunition, cavalry ...	—	2	2
Reins, bit, S.U. ...	1	1	1
Slings, ammunition belt boxes, cavalry ...	1	—	—
Straps, detachable shovel ...	—	2	2
Straps, girth, P.G.S., Mark II ...	4	4	4
Straps, pick and helve ...	—	—	2
Straps, suspending shoecase ...	1	—	1
Trees, P.M.G., cavalry, Mark II ...	1	1	1
Rests, Mark II ...	1	—	—

93. Detail of Infantry Sets.

(For Infantry whose equipment is carried on pack.)

Description	Number for each		
	Gun set	Tripod set	Ammunition set
SECTION D I.			
Bands, belly, P.M.G. ...	1	1	—
Bands, belly, P.M.G., straps, long ...	1	1	—
Bands, belly, P.M.G., straps, short ...	1	1	—
Bands, belly, P.M.G., straps, supporting ...	2	2	—
Bits, bridoon, P.G.S. ...	1	1	1
Caps, shovel, Mark II* ...	1	1	—
Cases, horseshoe, P.G.S. ...	1	1	1
Chains, collar ...	1	1	1
Collars, breast, P.G.S., Mark V ...	1	1	1
Collars, head, P.G.S., Mark IV ...	1	1	1
Cruppers, P.G.S., Mark V ...	1	1	1
Girths, P.G.S., Mark V ...	2	2	2
Girths, leather ...	—	—	1
Hangers, gun, sling ...	1	—	—
Hangers, tripod, sling ...	—	1	—
Pannels, P.G.S., Mark V pairs ...	1	1	1
Racks, boxes, belt, ammunition, infantry ...	1	1	2
Reins, bridoon, P.G.S. ...	1	1	1
Straps, girth, P.G.S., Mark II ...	4	4	4
Straps, pick and helve ...	—	3	—
Straps, detachable, shovel ...	1	1	—
Trees, P.G.S. ...	1	1	1

94. Detail of infantry sets (abbreviated scale).

(For infantry whose normal method of carriage is in limbered wagons, but who are also issued with a percentage of packsaddlery for emergencies.)

Description	Number for each		
	Gun set	Ammunition set	Remarks
SECTION D 1.			
Bands, belly, P.M.G. ...	1	—	
Bands, belly, P.M.G., straps, long	1	—	
Bands, belly, P.M.G., straps, short	1	—	
Bands, belly, P.M.G., straps, supporting ...	2	—	
Breechings, P.G.S., Mark V ...	1	1	
Cases, horseshoe, P.G.S. ...	1	1	
Chains, collar ...	1	1	
Collars, breast, P.G.S., Mark V ...	1	1	
Cruppers, P.G.S., Mark V ...	1	1	
Girths, P.G.S., Mark V ...	2	2	
Girths, leather ...	—	1	
Hangers, gun, sling ...	1	—	
Hangers, tripod, sling ...	1	—	
Pannels, P.G.S., Mark V pairs	1	1	
Racks, boxes, belt, ammunition, infantry ...	—	2	
Straps, girth, P.G.S., Mark II ...	4	4	
Trees, P.G.S. ...	1	1	

95. Description.

(a) Articles common to both cavalry and infantry sets.

1. *Case, horseshoe*.—For cavalry sets, the pattern formerly used for harness purposes, modified by the removal of the link from the back and the release of the strap with the chape (the latter being reduced in width to the size of the strap) are used.

For infantry the pattern formerly used for harness purposes (unmodified) is utilized.

2. *Bit, bridoon*.—Is an ordinary bridoon bit, but tinned to prevent rust. The mouthpiece is fitted at each end with a ring to receive the iron stops on the reins when the ordinary packsaddlery reins are used, or for universal saddlery reins to buckle to. The "T" pieces are secured to the rings by links and solid loops, and are for fitting under the leather loops on the packsaddlery head collar.

3. *Breeching, Mark V*.—Is used for preventing the packsaddle from slipping forward. The straps buckle to the body part of the breeching after being looped to the links on the pannels. It is supported by its hip strap, which passes through a loop on the crupper before buckling.

4. *Collar, breast, Mark V*.—Is used to prevent the load from slipping back. The straps, after passing through the links on the pannels, buckle to the body part of the breast collar. It is supported by its own neckstrap.

5. *Collar, head, Mark IV*.—Similar in design to the universal saddlery head collar, but the furniture is tinned iron, and it is fitted on the lower part of the head-

piece with leather loops for the "T" of the bridoon bit to fit into, and with a ring on the noseband.

6. *Crupper, Mark V.*—Is made with forked straps, which, after being looped to the rear arch of the packsaddle, buckle to the body of the crupper. The use of the crupper is to assist in preventing the saddle slipping forward.

7. *Girths, Mark V.*—Girths are made of worsted web. They are fitted with chapes and buckles at either end to connect up with the girth straps. These girths have no connecting piece as in earlier patterns, but may be crossed when girthing-up if desired.

8. *Girth, leather.*—Is a leather steadying girth, with a billet and buckle at each end. It can be lengthened by the "strap, extending."

9. *Pannels, Mark V.*—Each pannel consists of a leather back, with tan dowlas lining, the stuffing being horsehair. They are attached to the side bars by leather pockets, the front pocket having a strap and buckle for securing purposes. An opening in the outer side admits of adjustment of the stuffing.

Pannels are fitted with links to take the straps of the Mark V breast collar or breeching—the hooks attached to such links are intended for the chains of earlier marks.

The stuffing can be adjusted as required and kept in position by additional spot stitches if necessary.

10. *Straps, girth, Mark II.*—Are for buckling the packsaddle girth to. They are of leather, and made with a loop at one end.

11. *Cap, shovel, Mark II.*—Is a leather cap, made to fit on the pan of the G.S. shovel. It has a detachable strap (apart from the "Strap, shovel," which do not form part of the cap), which is used for securing it.

12. *Straps, pick and helve: shovel.*—Are for use with the articles shown in the "Details of Sets" applicable to the arm (Cavalry or Infantry) concerned.

The "*Straps, pick and helve,*" are for suspending the articles in question as part of the load.

The "*Strap, shovel,*" retains the handle of the shovel against the rear arch of the packsaddle.

(b) Articles special to cavalry sets.

13. *Carrier, water can and condenser.*—Consists of:—A leather tray with V-shape straps and quick-release attachment, two buckles and straps at back, two straps with quick-release attachments and ring on front.

14. *Hangers, gun, sling, cavalry.*—Consist of:—

- i. A front suspending pad with strapping, fitted at one end with a ring to attach to the near front hook of the packsaddle, and at the other end with a buckle to connect up with the V-sling attachment alluded to at (iii).
- ii. A rear suspending pad with strapping, fitted similarly to the pad at (i). This rear pad, however, differs in shape, and is much thicker in substance for the greater part.
- iii. A V-sling attachment, consisting of two straps, each carrying a sliding cranked link, with eye, and sewn to a triangular roller buckle. The ends of these straps connect to the buckles of the front and rear suspending pads.

This attachment is interchangeable with that used for the tripod hanger.

15. *Hanger, tripod, sling, cavalry.*—Is similar in principle to the gun hanger, but differs in the following respects as regards details:—

- i. There is a front suspending strap instead of a "pad with strapping." This strap is, however, similarly fitted with ring and buckle, as in the case of the pad.
- ii. The rear suspending pad, with strapping, is of equal substance throughout, and the strapping shorter than that of the gun hanger, or the front suspending strap of the tripod hanger.
- iii. The strap to connect with the triangular buckle is detachable, whereas in the gun hanger it forms part of the gun rest.

16. *Rack, boxes, belt, ammunition, cavalry.*—This is a canvas rack strengthened with leather, the body of which is attached directly to a wood bottom. Wire rope slings are provided for suspension purposes which are spliced round metal thimbles attached to eyebolts, which pass down through the wood bottom and metal plate and are riveted over the nuts.

A wood bearing bar is riveted across the centre of the back to prevent friction on the canvas.

The rack is divided into three compartments, each of which holds one box of ammunition in belt, *i.e.*, 750 rounds in all.

17. *Sling, ammunition belt, boxes, cavalry.*—This is a leather cradle, fitted with rings to hook to the off-side of

the packsaddle, and with buckles for securing the box; also with adjustment for variation in size of belt boxes.

18. *Strap, suspending, shoe-case.*—The "*Strap, suspending, shoe-case*" is an additional strap for the suspension of the "*Case, horseshoe, modified*," between the arches of the packsaddle.

19. *Tree, P.M.G., cavalry, Mark II.*—The principle of the ordinary general service adjustable tree is retained, but the alterations and additions as under are made:—

- i. Extension pieces project beyond the arches, to which are bolted leather-covered brackets to carry the spare barrel in its case, or the pick and helve.
- ii. A connecting bar of $\frac{1}{2}$ -in. steel rod, shouldered in the centre for the extension portion of the gun rest, is fitted between the arches, passing through both the flange of the extension pieces and the web of the angle of the arches before riveting.
- iii. A gun rest, with extension to the connecting rod, is added. This gun rest is shaped, covered with leather, and fitted with a strap to connect with the V-sling attachment of the gun hanger.

NOTE.—The tree of the gun rest is fitted with this rest when issued, but two additional gun rests with extension and strapping are issued with each complete gun equipment, ready for fitting regimentally to either of the trees on the ammunition horses, if circumstances should necessitate the employment of either of those trees for carriage of the gun.

20. *Reins, bit.*—These are of the universal saddlery pattern, and are only issuable for Cavalry Machine Gun Squadrons.

(c) **Articles special to infantry sets.**

21. *Trees, P.G.S.*—Consists of two steel arches (to which rigid hanging hooks are riveted) connected by side-bars made from padouk or sabicu wood.

The arches are jointed to the side-bars to admit of them turning automatically, thus allowing of adjustment to the backs of large or small animals, or to meet loss of condition, and to obviate the necessity of several sizes.

The side-bars are slotted for the girth straps to loop on.

22. *Bands, belly.*—These belly bands are broad leather girths 52½ in. in length by 3 in. in width, fitted at either end with a buckle and fixed leather loop to connect with the "*Straps, long*" and "*Straps, short*," which follow.

23. *Straps, long (or straps, short).*—Are straps fitted at one end with a fixed leather loop. The long strap is 48 in. by 1½ in., and the short 40 in. by 1½ in.

24. *Straps, supporting.*—These are narrow straps, 13 in. by ¾ in., which prevent the belly band dropping to the ground when the above-mentioned long and short straps are unbuckled to release the load.

25. *Chains, collar, P.G.S.*—Are used for infantry in place of the headrope. It consists of a length of chain with a bent "eye" link at one end, and a "T" piece at the other. It is also fitted with two cross aperture links for the "T" to pass through as required.

26. *Hanger, tripod, sling.*—Is designed so that the tripod may be slung in it to the hooks of the packsaddle.

It consists of a wood bearing bar, added to at the rear end by a wood block which keeps the tripod away from the animal's hip. Leather slings, felt lined, are attached to the bearing bar, the front sling being wider and longer than that at the rear. Both slings are fitted at either end with metal dees for hooking to the packsaddle, and the upper dees are provided with strap and buckle for securing both dees after the tripod is slung.

27. *Hanger, gun, sling.*—Is constructed on the same principle as the tripod hanger, but is intended for the carriage of the gun. It differs from the tripod hanger in the following respects :—

The bearing bar is added to at either end by wood blocks which extend below it, and keep the gun sufficiently away from the side of the animal.

Both slings are of similar width.

A leather chape carrying a metal square is screwed to the centre of the bearing bar on the upper side for the "girth, leather," to buckle to when required.

28. *Racks, boxes, belt, ammunition, infantry.*—Consist of a canvas body with wood bottom and rope slings. The body is bound with leather at the lower edge as also at the four upper corners, and is attached directly to the wood bottom at its outside edges. No partitions are arranged, but a shaped metal plate is inserted at each corner in order to strengthen them and define the shape at the top.

The rack is suspended by a rope sling at either end, which passes under the bottom and outside the ends. A metal square is attached to the wood bottom for the

leather girth to attach to, and holes are made for drainage purposes.

29. *Reins, bridoon*.—The rein is made from Preller leather. It is fitted at each end with a tinned iron stop to connect with the rings of the bit.

96. To assemble the parts.

(a) General Instructions.

NOTE.—The front arch of the packsaddle tree is narrower than the hind arch.

1. *Packsaddle*.—The *tree* is the frame of the packsaddle. The *pannels* are attached to the tree by means of front and rear pockets, into which the side-bars are inserted. The front pockets are fitted with buckles and straps for securing purposes.

The *girth straps* are looped to the side-bars over the upper edge, through the slots cut for the purpose.

The *girths* are buckled to the girth straps on the off-side in readiness for use.

The *crupper straps* are looped to the rear arch of the packsaddle and then buckled to the body of the crupper.

2. *Bit, bridoon*.—The *bridoon bit* at one end may be passed through the leather loop on the off-side of the head collar in readiness for "bitting" the animal.

3. *Breechings; Collars, breast*.—The straps of the breeching are first looped to the links on the pannels and then buckled to the body part of the breeching. The straps of the breast collar, after passing through the links of the pannels, are buckled to the body part of the breast collar.

(b) Instructions special to cavalry sets.

4. *Carrier, water can and condenser*.—To be carried on the packsaddle by passing the V-shape strap under the central bar, which connects the two arches, and then over the can. The two straps at the back are buckled round the brackets of front and rear arches. The rings on the two quick-release straps fit on to the near side hooks of packsaddle and underneath the rings of the ammunition rack.

5. *Packsaddle*.—Place the strap portion of the gun rest down through the slot in the "lay" of the near side pannel, through its own two sliding loops, then through the fixed loop on the underside of the gun rest.

6. *Gun hanger*.—Suspend to the hooks of the packsaddle on the near side by the rings at the back of the pads. *Note*.—The smaller of the two pads is to the front, and the leather loop above the ring on the larger (rear) pad is hooked on in addition to the ring.) A small leather "tie" should be employed to fasten the front ring of the sling to the front hook of the tree, to prevent it jolting off when the gun is taken off and the led horse is in motion.

7. *Sling, ammunition belt, boxes, cavalry*.—Suspend to the hooks of the packsaddle on the off-side by the rings, the girth straps being unfastened and then buckled over, the horizontal fixed straps forming the back of the sling. This prevents the sling moving.

8. *Tripod hanger*.—This is placed on after the sling above mentioned. It is suspended to the same hooks as the sling, but the front ring is placed *behind* the front

ring of the sling, this method preventing any possibility of the rings jolting off when the tripod is taken off, and the pack horse has to move away rapidly. (*Note.*—There is only one pad with the tripod hanger, and this is at the rear. A small leather tie should be employed to fasten the rear ring of the hanger to the rear hook of the tree.) The detachable strap is looped to the slot in the "lay" of the off panel, and then placed through the triangular buckle of the V-sling attachment.

9. *Detachable straps for shovel.*—Loop to the links of the pannels of the 1st and 2nd ammunition packsaddles.

10. *Straps, suspending, shoe-case.*—Place through the fold of the shoe-case ready for attaching to the arch of the packsaddle.

(c) Instructions special to infantry sets.

11. *Bands, belly, straps, long.*—To be looped to the bearing bar of the gun hanger on the gun set, and the tripod hanger on the tripod set, by passing up behind the bearing bars of the respective hangers, and then through their own fixed loops, the loops remaining at the upper edge of the bearing bars.

12. *Bands, belly, straps, short.*—To be looped to the nearside bar of the adjustable tree on the gun set, and the off-side bar of the adjustable tree on the tripod set, in a similar manner to that for the long strap, but the loops are to remain at the lower edge of the side bars.

13. *Bands, belly, straps, supporting.*—To be looped up through the slot in the "lay" of the panel on either side of gun or tripod sets.

The *belly band* is afterwards buckled to these straps, and is supported by them whenever it is released from its long and short straps; it would otherwise drop to the ground.

14. *Straps, pick and helve.*—Looped to the bearing bar of the tripod hanger by passing down behind the bearing bar, and then through their own fixed loops.

15. *Straps, detachable, shovel.*—To be looped to the rear arch (near side) of the gun set, and the rear arch (off side) of the tripod set.

16. *Saddling.*—Before saddling it is essential that the animal's back should be free from dirt, and any dried sweat or matted hair brushed out. The pannels should be thoroughly dried, beaten, and freed from any dirt or grit before being placed on the animal's back. Neglect of these precautions is the most fertile source of sore backs. Constant attention must be paid to the stuffing of the pannels, and care taken to prevent them from becoming hard and lumpy.

When possible, animals should not be kept standing longer than is necessary when saddled and loaded.

If a saddle has shifted, do not try to push it into a better position; off-load, off-saddle, and re-saddle properly.

Do not allow men to hang their rifles or equipment on the loads, or hold on to them on the march.

Girths may, if wished, be crossed under the animal's belly, and this method is often useful when there is a tendency for the girths to slip. When the girths are fastened the buckles should rest on the lower edges of the pannels, as this will prevent buckle galls.

The breeching and breast collar should be so fitted that

movement of the animal is not impeded. Constant rubbing of either of these articles, when fitted too tightly, will inevitably cause galls.

The crupper requires careful fitting, as otherwise the animal's dock will be galled. A good rough guide is to arrange that the breadth of the hand will pass between the body of the breeching and the body of the crupper.

The bridoon bit should hang low enough to prevent the corners of the animal's mouth from being wrinkled.

APPENDIX.

RANGE TABLE FOR MARK VII AMMUNITION.

Muzzle velocity with Mark VII ammunition 2440/s.

Weight of bullet 174 grains

Weight of charge, cordite 38 „

Range			Range		
Angle of Elevation			Angle of Elevation		
Yards.	Degrees.	Minutes.	Yards.	Degrees.	Minutes.
100	—	3	1,600	2	35
200	—	7	1,700	2	57
300	—	11.5	1,800	3	21
400	—	16.5	1,900	3	47.5
500	—	22	2,000	4	16.5
600	—	28	2,100	4	48
700	—	35	2,200	5	22.5
800	—	43	2,300	6	—
900	—	52	2,400	6	41.5
1,000	1	2	2,500	7	27
1,100	1	13.5	2,600	8	16.5
1,200	1	26.5	2,700	9	11
1,300	1	41	2,800	10	10.5
1,400	1	57	2,900	11	15
1,500	2	15			

KEY TO PLATES I TO VIII.

.303-INCH VICKERS MACHINE GUN.

The same numbers are used for the parts to which they refer in all the plates.

1. Casing, barrel.
2. Tube, steam.
3. Bracket, foresight.
4. Gland.
5. Casing, breech.
6. Cover, front.
7. Cover, rear.
8. Sight tangent.
9. Bar, trigger.
10. Lock, rear cover.
11. Rear crosspiece.
12. Lever, firing.
13. Lever, trigger bar.
14. Catch, safety.
15. } Plugs, screwed.
17. Adapter for condenser.*
18. Plug, cork.
19. Guide, front, barrel-bearing.
20. Bracket, crosshead.
21. Cams, right and left.
22. Steps of cams, right and left.
23. Catch, front cover.
24. Pin, joint cover.
25. Pin-T, fixing, rear cross-piece.
26. Pin, fixing, crank handle.
27. Slides, right and left.
28. Roller.
29. Pin, joint, rear crosspiece.
30. Bracket, checklever.
31. Lever, check.
32. Bracket, elevating joint.
33. Stop, elevating.
34. Plate, bottom, breech casing.
35. Shutter.
36. Hooks of front cover catch.
37. Hole for keeper pin, front cover catch.
38. Lever of catch, front cover.
39. Grooves in front cover catch to clear "36."
40. Plunger, front cover catch.
41. Bridge, rear cover.
42. } Spring tangent sight.
42. } Piston
43. Grooves in rear cover ribs on "5."
44. Ramps, rear cover.
45. Spring, rear cover lock.
46. Spring, trigger bar.
47. Lug on trigger bar "46."
48. Base of tangent sight stem.
49. Hooks of rear cover lock.
50. Lug on rear cover lock "45."
51. Slot in trigger bar "86."

* Where earlier pattern of condenser tube is fitted, the protective condenser boss occupies the location of the adapter.

51. Lug on trigger bar for "13."
52. } Thumbpiece, shutter
53. } catch.
55. Plunger, shutter catch.
56. Arms of rear-crosspiece.
57. Handles, traversing.
58. Pawl, firing lever.
59. Spring, safety catch, with piston.
60. Pin, safety catch.
- 61a. Finger grips, safety catch.
61. Pin, axis, firing lever.
62. } Thumbpiece, firing lever.
64. Pin, keeper, check lever.
65. Barrel.
68. Casing, lock.
69. Plate, side, right or left.
70. Crank.
71. Handle, crank.
- 71a. Tail of crank handle.
- 71b. Knob of crank handle.
72. Rod, connecting.
- 72a. Stem of connecting rod.
73. Fuzee.
- 73a. Chain, fuzee.
74. Spring, fuzee.
- 74a. Hook, fuzee spring.
75. Box, fuzee spring.
- 75a. Screw, adjusting, fuzee spring.
76. Block, feed.
77. Cannelure in "67" for asbestos packing.
78. Trunnion block, barrel.
79. Lock.
80. Levers, side (pair).
81. Sockets of side lever for "72a."
82. Extractor.
83. Gib.
84. Spring, gib.
85. Cover, gib spring.
86. Trigger.
87. Lever, extractor, right.
88. Tumbler.
89. Spring, lock.
90. Pin, firing.
91. Sear.
92. Spring, sear.
93. Flanges of lock casing.
94. Interruptions in flanges of lock casing.
95. Slots in lock casing for "99."
96. Bearings on lock casing for "80."
97. Upper extractor stop of lock casing.
98. Bent of extractor lever for "80."
99. Lugs on side levers for "95."
100. Bush, axis, side levers.
101. Pin, split, bush, axis, side levers.
102. Horns of extractor.
- 102a. Grooves in extractor for "68."
103. Shoulders of extractor for "87."
104. Grooves in extractor for side plate springs.
105. Hole in extractor for "90."
106. Recess in extractor for "83."
107. Pin, trigger.
108. Pin, tumbler.
109. Key of pin, tumbler.
110. Projection on firing pin for "89."

- 111. Lever, top, feed block.
- 112. Lever, bottom, feed block.
- 113. Pins, split, fixing, top and bottom levers, feed block.
- 114. Stud of top lever for feed block side.
- 114a. Slide, feed block.
- 115. Pawl, top feed block, rear.
- 115a. Thumb grips of "115" and "116."
- 116. Pawl, top, feed block, front.
- 117. Spring, top pawls, feed block.
- 118. Pawls, bottom, feed block (pair).
- 119. Pin, axis, bottom pawl, feed block.
- 120. Finger plate of bottom pawls, feed block.
- 121. Spring, bottom pawls, feed block.
- 122. Cup, muzzle attachment.
- 123. Casing, outer, muzzle attachment.
- 124. Cone, front, muzzle attachment, Mark I.
- 125. Cone, front, muzzle attachment, Mark II.
- 126. Gland, muzzle attachment.
- 127. Disc, muzzle attachment.
- 128. Vent, bullet, muzzle attachment.

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PARTS OF THE GUN.

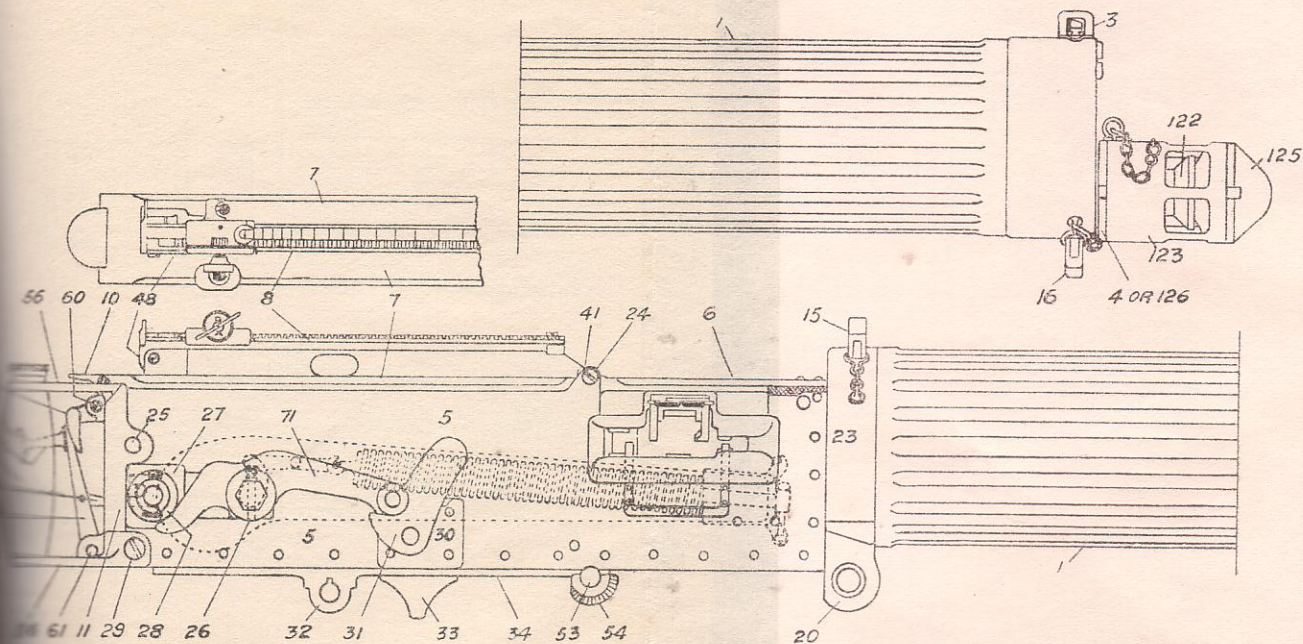
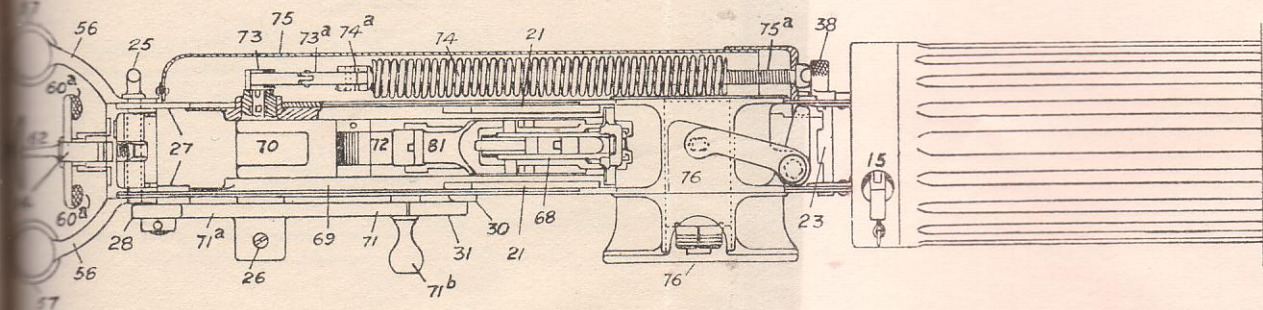


PLATE I.

[For Key, see p. 156.]

Fig. 1 is a perspective view of the device. It features a series of parallel, pointed teeth (124) extending from a rectangular handle assembly (126). A small, rectangular component (3) is mounted on the handle assembly, positioned between the teeth and the main body.



[For Key, see p. 157.]

PARTS OF THE GUN.

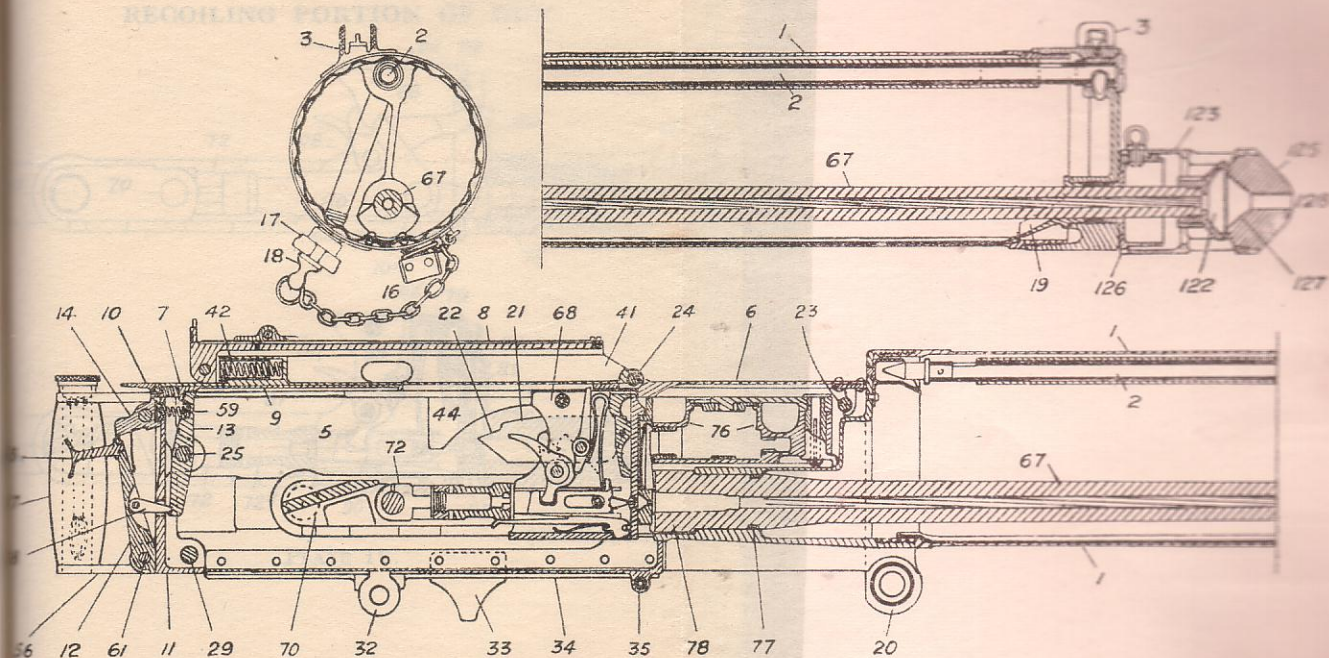


PLATE III.

[For Key, see p. 152.]

RECOILING PORTION OF GUN.

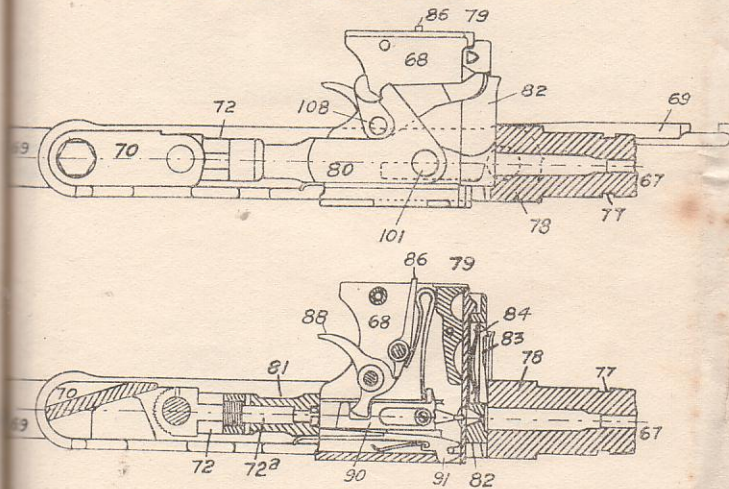
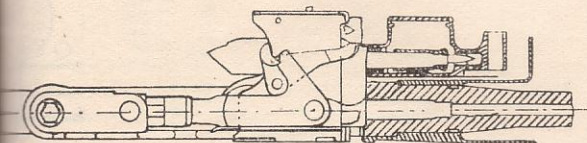


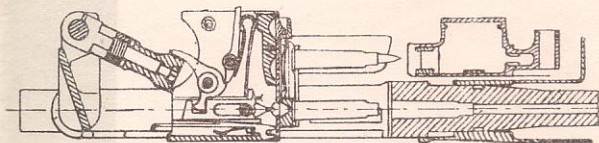
PLATE IV.

[For Key, see p. 157.]

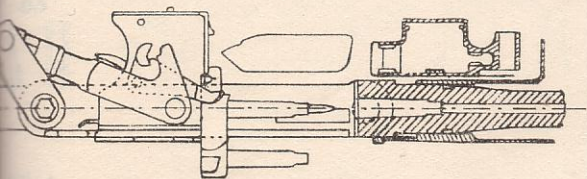
WORKING POSITIONS OF LOCK.



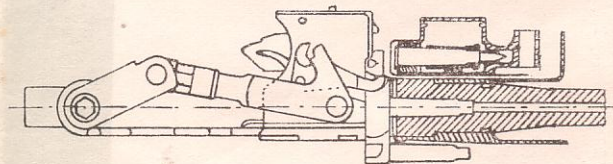
Lock fully home and just fired. Extractor engaging with empty case in chamber and cartridge in feed block.



Lock and barrel recoiling. Extractor withdrawing empty case from chamber and a cartridge from the feed block, firing pin cocked and safety sear engaging.



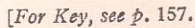
Lock in nearly fully recoiled position. Barrel returning. Extractor down, brings cartridge in line with chamber and empty case either falls off or is pushed off when extractor rises.



Lock returning, barrel home, extractor being raised by levers, leaving empty case to be ejected, cartridge in chamber, and about to engage with another in the feed block.

[See pp. 69 and 71 (Secs. 29 and 30).]

PLATE VI.



PARTS OF THE COVER, ETC.

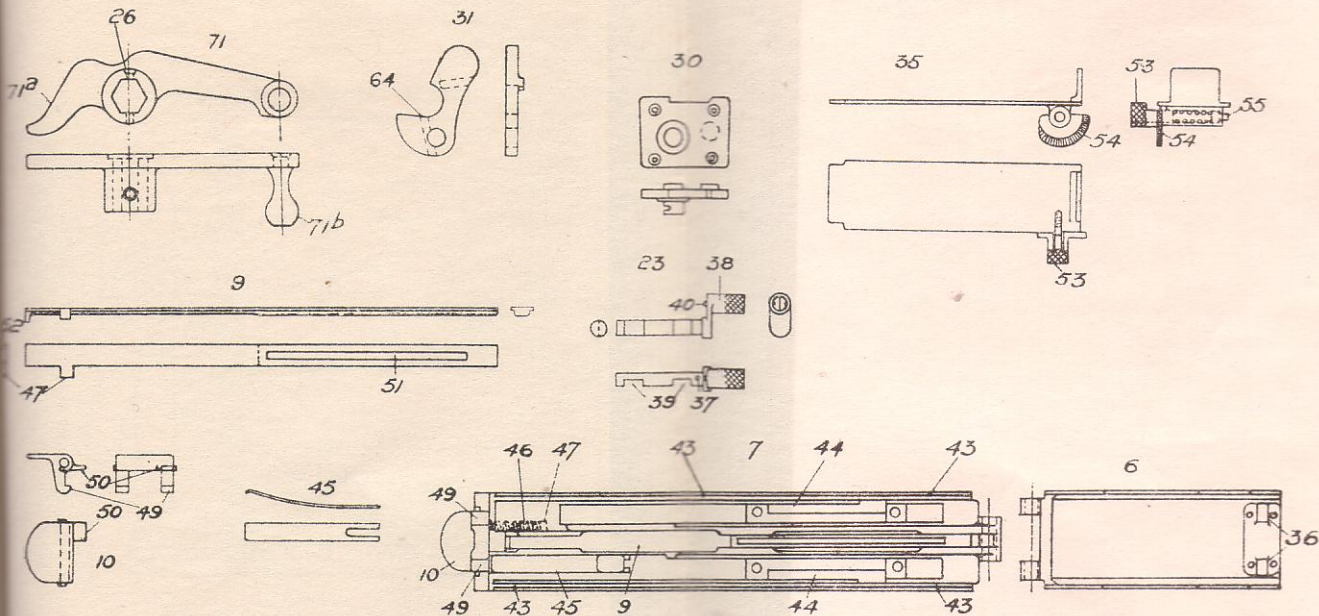
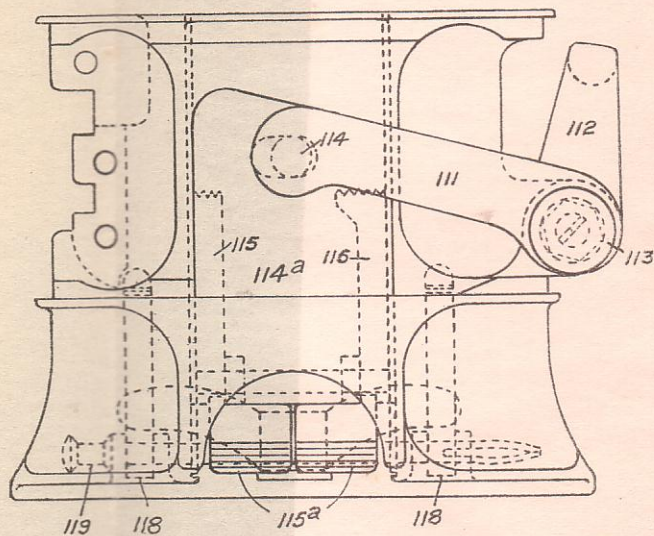
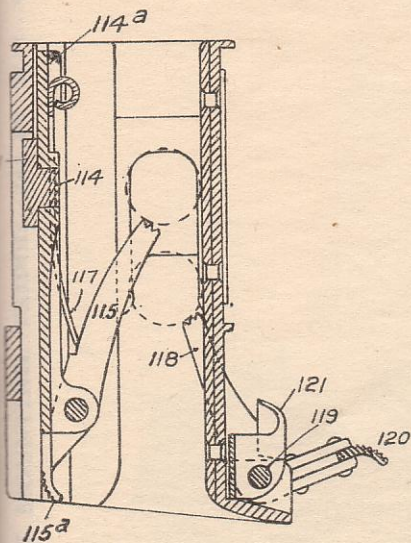


PLATE VII.

[For Key, see p. 156.]

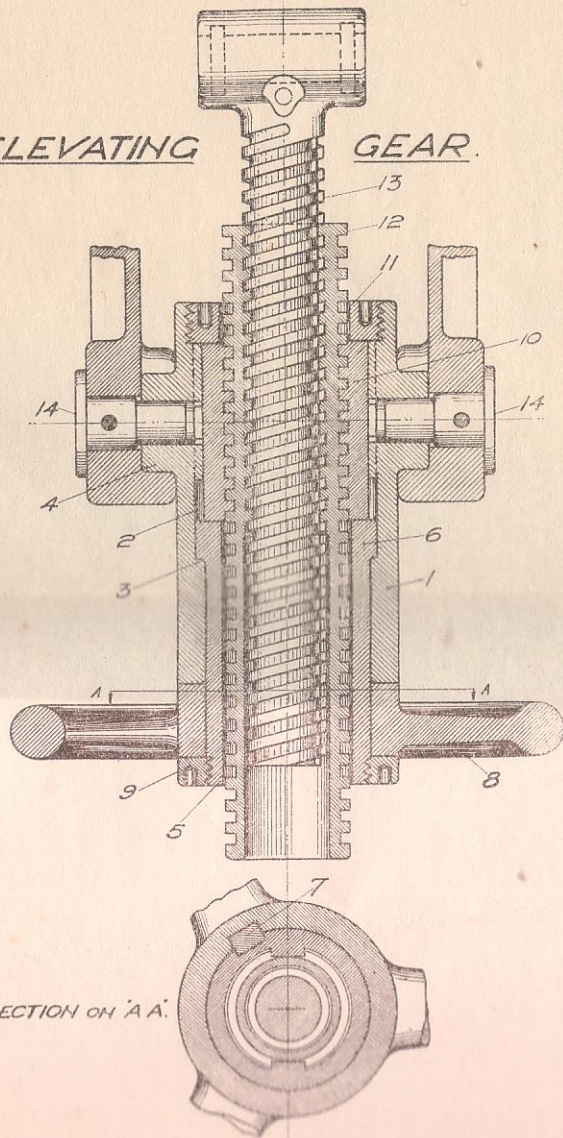
FEED BLOCK.



[For Key, see p. 158.]

PLATE VIII.

ELEVATING GEAR.



KEY.

1. Tumbler.
2. Feathers, tumbler.
3. Shoulder, tumbler.
4. Trunnions, tumbler.
5. Bush, wheel elevating.
6. Collar, bush, wheel elevating.
7. Feather, wheel elevating.
8. Wheel elevating.
9. Nut, wheel elevating.
10. Nut, elevating.
11. Nut, tumbler.
12. Screw, elevating, outer.
13. Screw, elevating, inner.
14. Pins, tumbler.

a. Crosshead.
 b. Elevating gear.
 c. Socket.
 d. Arm, crosshead.
 f. Screw, clamp, checking traverse.
 g. Tumbler, elevating gear.
 h. Bolt, jamming, elevating gear.
 j. Front legs.
 k. Rear legs.
 m. Shoes.
 n. Socket lugs.
 s. Stud joints & jamming handle, front legs.
 t. Stud, pin & jamming handle, rear leg.
 v. Chain, securing, elevating screw.
 w. Direction dial.
 x. Elevating wheel.
 y. Pointer, direction dial (M^o II).
 z. Pointer, elevating.

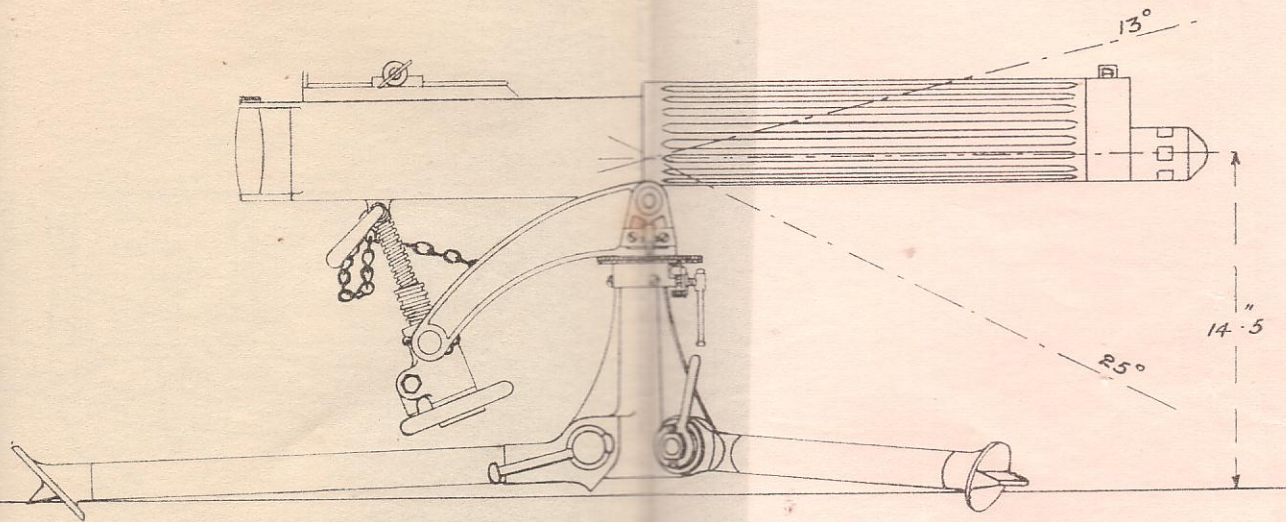
SIDE ELEVATION.

PLATE X.

- a. Crosshead.
- b. Elevating gear.
- c. Socket.
- d. Arm, crosshead.
- f. Screw, clamp, checking traverse.
- g. Tumbler, elevating gear.
- h. Bolt, jamming, elevating gear.
- j. Front legs.
- k. Rear legs.
- m. Shoes.
- n. Socket lugs.
- s. Stud, joint's & jamming handle, front legs.
- t. Stud, pin & jamming handle, rear leg.
- v. Chain, securing, elevating screw.
- w. Direction dial.
- x. Elevating wheel.
- y. Pointer, direction dial (M^o II).
- z. Pointer, elevating.

[See p. 305.]

MOUNTING, TRIPOD, 303-IN., M.G., Mk. IV.



SIDE ELEVATION.

PLATE XI.

[See p. 35.]

WAGON, LIMBERED, G.S.

Scale 1/24.

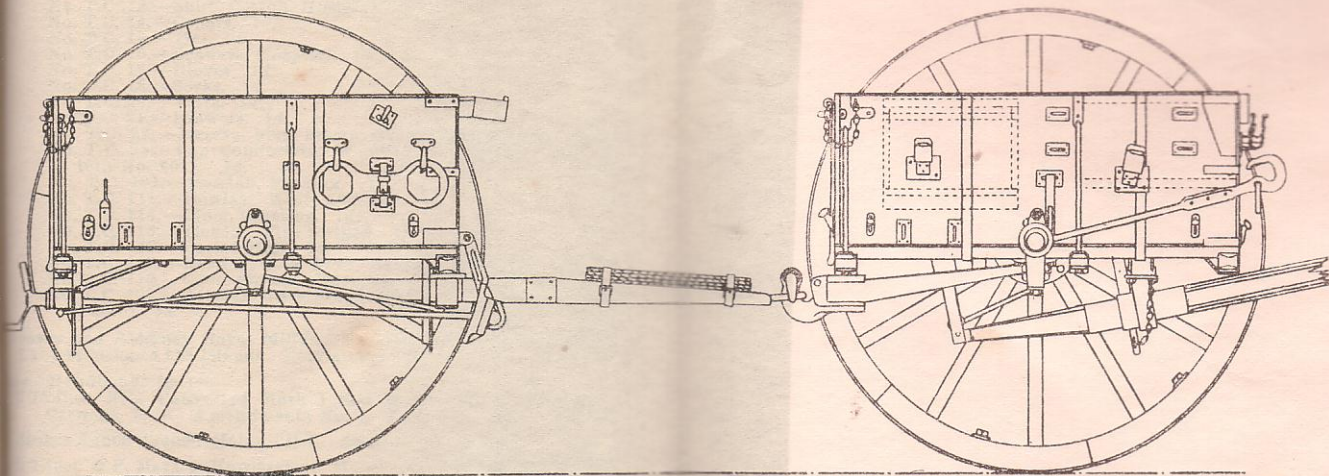


PLATE XII.

[See p. 135.]

Textiles and Clothing :—

- No. T.C. 1.—Cloths, Tartans and Tweeds. 1*d*.
 No. T.C. 2.—Serges, Worsteds, etc. 1*d*.
 No. T.C. 3.—Shirtings. 1*d*.
 No. T.C. 4.—Miscellaneous. 1*d*.
 No. T.C. 5.—Cotton Fabrics. 1*d*.
 No. T.C. 6.—Linen and Jute Fabrics. 1*d*.
 No. T.C. 7.—Frocks, White. 1*d*.
 No. T.C. 8.—Drawers, Brown Cotton. 1*d*.
 No. T.C. 9.—Sweaters, White. 1*d*.
 No. T.C. 10.—Jerseys, Striped Gymnasia. 1*d*.
 No. T.C. 11.—Vest, Cotton Gymnasia. 1*d*.
 No. T.C. 12.—Jacket, Pyjama. Trousers, Pyjama. 1*d*.
 No. T.C. 13.—Shirt, Cotton, Hospital. 1*d*.
 No. T.C. 14.—Collars. 1*d*.
 No. T.C. 15.—Ties. 1*d*.
 No. T.C. 16.—Drawers, Hospital. 1*d*.
 No. T.C. 17.—Gloves. 1*d*.
 No. T.C. 18.—Socks. 1*d*.
 No. T.C. 20.—Vests. 1*d*.
 No. T.C. 21.—Drawers. 1*d*.
 No. T.C. 22.—Jerseys, blue, brown, navy-blue, pullover. 1*d*.
 No. T.C. 23.—Cap Comforters, Woollen, drab, Universal (Pat-
 tern No. 201). 1*d*.
 No. T.C. 101.—Hessian, Packing. 1*d*.
 No. T.C. 111.—Dowlas. White and Tan. 1*d*.
 No. T.C. 114.—Linen Sheeting. 1*d*.
 No. T.C. 115.—Ticken. Blue Striped. 1*d*.
 No. T.C. 116.—Curled Hair. 1*d*.
 No. T.C. 117.—Netting, Sand-Fly; Netting, Mosquito. 1*d*.
 No. T.C. 119.—Counterpanes, Hospital. 1*d*.
 No. T.C. 161.—Covers, Waterproof, Black, G.S. Cotton Duck
 Fabric. 3*d*.

Jersey and Alderney Royal Militia. Regulations. With the Militia
 Laws relating to the Islands. Provisional. 3*s*.

Ans. Handbooks for :—

- 2·75-inch B.L. Converted Mark I and Mark I Guns on Mark 1
 Carriage, 1920. Amendments No. 1. Sept. 1923. 1*d*.
 Stokes 3-inch Trench Motor. M.L. Land Service. 1919. 1*s*. 6*d*.
 3·7-inch Q.F. Mark I Howitzer on Mark I Carriage, Land Service.
 1926. 7*s*. 6*d*. Amendment No. 1. Dec. 1928. 1*d*.
 4-inch Q.F. Mark V Gun, Land Service, 1916. Amendments No. 2.
 Nov. 1923. 1*d*.
 4·5-inch Q.F. Howitzer, Marks I and II, on Marks I and Ia Field
 Carriages, Land Service, 1927. 4*s*. 6*d*. Amendment No. 1.
 Oct. 1929. 1*d*.
 6-inch B.L. Mark XIX Gun on Travelling Carriage. Land Service,
 1920. 4*s*.
 Do. Amendment No. 2. March 1923. 1*d*.; No. 3. Sept. 1923.
 1*d*.

Guns, Handbooks for—continued.

- 6-inch B.L. 26-cwt. Mark I Howitzer on Mark I Travelling Carriage, Land Service, 1924. 3s. 6d.
Do. Amendments No. 1. May 1925. 1d.; No. 2. Jan. 1926. 1d.; No. 4. Dec. 1928. 1d.
6-inch M.L. Trench Mortars, Marks I, II and III. Land Service, 1920. 1s.
Do. Amendment (No. 1), Aug. 1923. 1d.
8-inch B.L. Howitzer. Marks VI–VIII. 7s.
Do. Amendments No. 3. March 1923. 2d.; No. 4. Sept. 1923. 1d.; No. 5. June 1924. 2d.
9·2-inch B.L. Guns, Mark IX “C,” Mark IX, and Marks X, X*, and X*, on Carriages, Garrison, Barbette, Marks IV, V, Va, Vb, VI and VIa. Land Service, 1923. (G.H. 80.) 2s. Addendum, No. 1. Ordnance Q.F. Hotchkiss 6-pr. used as Sub-Calibre Gun in outside position. 9d. Amendment No. 2. Dec. 1925. 1d.
9·2-inch B.L. Howitzer. Marks I and II. 1920. 3s. Amendments No. 2. Sept. 1922. 3d. Amendments No. 3. March 1923. 1d.; No. 4. Dec. 1923. 1d.; No. 5. July 1924. 2d.; No. 6. Dec. 1925. 1d.
9·2-inch B.L. Marks X, X* and X* Guns, on Mark V Mounting (Land Service) 1926. Amendment No. 5. Jan. 1929. 1d.
9·2-inch B.L. Marks X, X* and X* Guns, on Mark VI Mounting (Land Service), 1926. Amendment No. 4. Jan. 1929. 1d.
3-pr. 2 cwt. Q.F. Marks I and II Guns, on Mark I Mountings, Marks I, Ia and II Medium Tanks. Land Service, 1924. 4s. 6d.
6-pr. Q.F. Guns on Casement Mounting. 1920. 2s. 6d.
13-pr. Q.F. Gun on Mark I Field Carriage, 1914. Amendment No. 3. Sept. 1923. 1d.
13-pr. Q.F. Marks I to III Guns on Mark I Field Carriage. Land Service, 1929. 3s. 6d.
18-pr. Q.F. Mark I, I*, II and II*. on Carriage, Field, Mark I. Land Service, 1921. 2s. 6d. Amendments No. 1. Sept. 1922. *Gratis*. Amendments No. 2. March 1923. 1d.; Amendments No. 3. May 1923. 1d.
Do., on Carriages, Field, Marks I*, I** and II, Land Service, 1922. 3s. 6d. Amendments No. 1. Sept. 1922. *Gratis*. Amendments No. 2. March 1923. 1d.; Amendments No. 3. May 1923. 1d.
18-pr. Mark IV Gun on Marks III, III*, III*, IV and V. Field Carriage Land Service. 1924. 2s. 6d. Amendments No. 2. Jan. 1925. 1d.; No. 4. Feb. 1926. 2d.; No. 6. Sept. 1928. 3d.
18-pr. Q.F. Gun. Mark IV, Carriages. Marks III*, IV and V. 1928. Amendment No. 1. Jan. 1929. 1d.
18-pr. Q.F. Marks I to II* Guns on Mark I to II Field Carriage (Land Service), March 1929. 5s. 6d.
60-pr. B.L. Marks I to I** Guns, on Marks I and III Field Carriage (Land Service), 1921. 6s. 6d. Amendments No. 1. July 1922. 1d.; Amendments No. 2. March 1923. 2d.; Amendments No. 3. March 1925. 1d.

Guns, Handbooks for—continued.

- 60-pr. B.L. Marks II and II* Guns on Mark IV Field Carriage. 10s. 6d. Amendments No. 1. 2d. Amendments No. 2. 2d.; Amendments No. 3. Nov. 1922. 2d.; Amendments No. 4. March 1923. 2d.
60-pr. B.L. Marks II and II* Guns on Mark IV Travelling Carriage, Land Service, 1926. 12s. 6d. Amendments No. 1. June 1927. 2d.; No. 1. Aug. 1928. 2d.
Gun Drills :—
2·75-inch B.L. Gun, Converted Mark I and Mark I, Carriage, Mark I. Feb. 1923. 6d. Amendment. 1d. Amendments, July 1924. 1d.
3-inch 20-cwt. Q.F. A.A. Gun, Marks I and III, on (a) Motor Lorry Mounting; (b) Fixed Mounting or Travelling Platform. Oct. 1923. 4d.
3·7-inch Q.F. Howitzer, Mark I, Carriage, Mark I. 1928. 9d.
4-inch Q.F. Mark III Gun (Land Service), 1924. 8d. Amendment No. 2. Jan. 1928. 1d.
4-inch Q.F. Gun, Mark V (Land Service), 1924. 3d.
4·5-inch Q.F. Howitzer, Marks I and II, Carriage, Mark I and Ia April 1928. 6d.
4·7-inch Q.F. Gun (Land Service), 1924. 4d. Amendment No. 2. Jan. 1928. 1d.
6-inch B.L. 26-cwt. Howitzer, Mark I, Carriage, Mark I. 1926. 6d.
6-inch B.L. 26-cwt. Howitzer, Mark I, Carriage Mark I, 60-pr. B.L. Gun, Marks II and II*, Carriage Mark IV, 1929. 8d.
6-inch B.L. Marks VII and VII* Guns on Carriages Garrison C.P. Mark II. (Land Service.) 1922. 6d. Amendment, April 1924. 1d.; Jan. 1927. 1d.; No. 1. Jan. 1929. 1d.
6-inch B.L. Gun, Mark XIX, Carriages, Marks VIII and VIIa. 9d.
6-inch B.L. Gun, Mark XIX, Carriages Marks VIII and VIIa, and 8-inch B.L. Howitzer, Marks VII, VII*, VII** and VIII, Carriages Marks VII and VIIa. May 1929. 1s. 3d.
6-inch “B” Q.F. Guns on Carriages, Garrison C.P., Mark II (Land Services), 1924. 4d.
Mortar Drill for 6-inch Medium Mortar, Marks I, II and III. Jan. 1923. (G.D. 52.) 2d.
8-inch B.L. Howitzer, Marks VII, VII*, VII** and VIII. Carriages, Marks VII and VIIa. 1923. 6d. Amendment No. 1. 1d.
9·2-inch B.L. Marks X, X* and X* Guns on Mark V Mounting (Land Service). 1926. 6d. Amendments No. 3. Jan. 1927. 1d.; No. 4. Jan. 1928. 1d.; No. 5. Jan. 1929. 1d.
9·2-inch B.L. Marks X, X* and X* Guns on Mark VI Mounting (Land Service). 1926. 9d. Amendments No. 3. Jan. 1927. 1d.; No. 4. Jan. 1929. 1d.
9·2-inch B.L. Howitzer, Mark II, Carriage, Siege, Mark II. 9d. Amendment No. 1. 1d.
9·2-inch B.L. Howitzer, Mark II, Carriage Mark II. 1929. 1s. 3d.
12-pr. 12-cwt. Q.F. Gun (Land Service). 1925. 6d. Amendment Jan. 1928. 1d.

Gun Drills—continued.

- 13-pr. Q.F. Gun, Marks I and II, Carriage Mark I, and 18-pr. Q.F. Gun Marks I to II, Carriages, Marks I, I*, I** and II. 1928. 9d. Amendment No. 1. June 1929. 1d.
- 18-pr. Q.F. Mark IV, Carriages, Marks III*, IV and V. 1928. 6d. Amendment No. 1. Jan. 1929. 1d.
- 18-pr. Q.F. Gun, Mark IV, Carriage, Mark V. 3d. Amendments. Feb. 1925. 1d.
- 60-pr. B.L., Marks I—I*, Carriages, Marks I and III. 6d. (6d. Amendment; 1d. Amendment No. 1. Jan. 1928. 1d.
- 60-pr. B.L., Marks II and II*. Carriages, Mark IV. 1923. (G.D. 46.) 3d.
- 60-pr. B.L. Gun, Marks II and II*. Carriage Mark IV. Amendments No. 1. April 1924. 1d.; Jan. 1926. 1d.
- Amendments:—Feb. 1922. 1d.; Feb. 1925. 1d.; May 1925. 1d. Jan. 1926. 2d.; Jan. 1926. 1d.

See also MACHINE GUNS; MUSKETRY REGULATIONS, Part I; and ROSS MAGAZINE.

Health of the Army. Report for the year 1922, Vol. LVIII. 3s.

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|-----|-----|---------------------------|
| Do. | Do. | 1923, Vol. LIX. 3s. 6d. |
| Do. | Do. | 1924, Vol. LX. 3s. 6d. |
| Do. | Do. | 1925, Vol. LXI. 3s. 6d. |
| Do. | Do. | 1926, Vol. LXII. 3s. 6d. |
| Do. | Do. | 1927, Vol. LXIII. 4s. 6d. |

Height and Range-Finder. No. 2, Mark II, Type U.B.2 (Barr and Stroud). Handbook. Jan. 1927. 1s.

Historical Records of the British Army:—

- Horse Guards. 5s.
- Dragoons, 1st, 3rd, 14th, and 16th. 4s. each. 18th. 3s.
- Marine Corps. 3s.
- Foot, 10th, 11th, 12th, 13th, 15th, 16th, 17th, 18th, 19th, 21st, 22nd, 36th, 39th, 53rd, 67th, 71st, 72nd, 73rd, 86th, and 87th. 4s. each.
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Histories, Short, of the Territorial Regiments of the British Army. 69 numbers, each 1d. (2d.).

- Do. The Scots Guards. 1d.
- Do. The 6th (Inniskilling) Dragoons. 1d. (Out of print)

History of the Great War. See WAR.

Horses, Field, Pack, Medium and Heavy Artillery. Instructions for Practice (including Movable Armament). Feb. 1921. 3d.

Hot Water Supply and Heating Installations for W.D. Purposes. Notes on, March 1929. 1s.

Hygiene. Manual of Military. 1921. 1s.

See also PHYSIOLOGY and SCHOOLS.

Indian Empire, The. A short Review and some Hints for the use of Soldiers proceeding to India. 6d. (7d.)

- Do. Amended 1911 Version. A short Review and some Hints for the use of Soldiers proceeding to India. 6d.

Infantry Training. Vol. 1. Training. 1926. 1s. Amendment No. 1. Feb. 1928. 1d.; No. 2. Jan. 1929. 1d.

- Do. Vol. 2. War. 1926. 9d. Amendments (No. 2). Jan. 1927. 1d.; No. 4. Feb. 1928. 1d.; No. 5. Jan. 1929. 1d.

Institutes. Garrison and Regimental. Rules for the Conduct of February, 1929.

Italian Cavalry Training Regulations. 1911. Training for Marches, Tactics of Minor Units and Training of Patrols. Translated. 4d.

Jamaica. Standing Orders. 1912. 1s.

Jersey. Royal Militia of the Island of. Regulations. 1914. With the Jersey Militia Laws, 1905. 1s. 3d.

- King's Regulations for the Army and the Army Reserve. 1928. 1s. 9d. Amendment No. 1. Aug. 1928. 1d.; No. 2. Sept. 1928. 1d.; No. 3. Oct. 1928. 1d.; No. 4. Nov. 1928. 1d.; No. 5. Nov. 1928. 1d.; No. 6. Dec. 1928. 1d.; No. 7. Jan. 1929. 1d.; No. 8. Feb. 1929. 1d.; No. 9. Feb. 1929. 1d.; No. 10. March 1929. 1d.; No. 11. April 1929. 1d.; No. 12. May 1929. 1d.; No. 13. June 1929. 1d.; No. 14. July 1929. 1d.; No. 15. Aug. 1929. 1d.; No. 16. Sept. 1929. 1d.

King's Regulations, 1928. Comparative Table. June 1928. 1d.

Kit Plates:—

Artillery Royal:—

- (6) Garrison. Kit laid out for Inspection. 1909. (Out of print)
- (10) Do. Kit in Barrack Room. 1909. 2d.

Cavalry. 1891. 1d.

Engineers. Royal:—

- No. 1. Dismounted. Details of Shelf and Bedding, with Marching and Drill Orders ready to put on. 1914. Each 1d.
- No. 2. Dismounted. Full Kit laid out for Inspection in Barrack Room. 1914. 1d.
- No. 4. Mounted N.C.O. or Driver and Field Troop Sapper. Full Kit laid out for Inspection in Barrack Room. 1910. 1d.
- No. 5. Mounted. Detail of Shelf and Bedding. 1910. 1d.
- No. 6. Driver, with pair of Horses, Field Kit laid out for Inspection on Parade, including Articles carried in Valise in Baggage Wagon. 1915. 2d.

Medical Corps. Royal Army. Kit in Barrack Room. 1913. 2d.

Ordnance Corps. Royal Army. For guidance of Marching Order and Kit Inspections. 2d.

- Kit in Barrack Room, with arrangement of Locker for Daily Inspection. 2d. Boys 2d.; Men 2d.
- Kit in Barrack Room, with arrangement of Shelf for Daily Inspection. 2d.
- Kit laid out for Inspection. 2d.

Land and Air Forces of the British Oversea Dominions, Colonies, Protectorates and Mandated Territories (exclusive of India and Iraq). Notes. 1928. 1s. 3d.

Large Formations. The Operations of. (Conduite des Grandes Unités.) Translated from the Field Service Regulations of the French Army, dated Oct. 28, 1913. 6d.

Law. Manual of Military. 1929. 3s. 6d.

Do. Amendments, May 1919. 1d.; Aug. 1926. 1d.; April 1929. 1d.; June 1929. 1d.; Sept. 1929. 1d.

Machine Gun Training. 1925. 1s. Amendments No. 1. Jan. 1927. 1d.; No. 2. Dec. 1927. 2d.; No. 3. May 1928. 2d.; No. 4. Dec. 1928. 1d.; No. 5. June 1929. 1d.

Magazine Regulations. 1922. 1s. 6d. Amendments, Nov. 1923; Feb. 1924; Dec. 1924; April 1925; Aug. 1925; Oct. 1925; Nov. 1926; March 1927. Each 1d. No. 1*. Dec. 1927. 1d.; No. 2. July 1928. 1d.; No. 3. April 1929. 1d.

Malaria. Observations on, by Medical Officers of the Army and Others. (With Plates and Diagrams.) 1920. 6s.

Manœuvres, Army. Report 1925. 4s. 6d.

Mapping from Air Photographs. 4s.

Map Reading and Field Sketching. Manual. 1921. 3s. See also PROTRACTOR.

Mechanical Transport. See TRANSPORT.

Military Corps. Royal Army. (See also TERRITORIAL FORCE):—
Admission to. Regulations for. 1926. 2d. Amendments No. 1. July 1929.

Royal Army Medical Corps (T.A.) and the Army Dental Corps. Standing Orders, 1924. 1s. Amendments. 1d. Amendments No. 3. 1d.; No. 4. 1d.; No. 5. 1d.; No. 6. 1d.; No. 7. 1d.; No. 8. 1d.; No. 9. 1d.; No. 10. 1d.; No. 11. 1d.; No. 12. 1d.

Training. 1925. 1s. Amendments. Sept. 1926. 1d.; No. 1. Dec. 1928. 1d.

Medical Department. Army. Index to Appendices of Reports from 1859 to 1896. 3d.

Medical Diseases. In Tropical and Sub-Tropical Areas. Memoranda on (Fourth Edition.) 1924. 2s. 6d.

Medical History of the Great War. See WAR.

Medical Service. Army:—

Regulations. 1923. 1s. 6d. Amendments, Aug. 1925. 1d.; Jan. 1927. 1d.; No. 1*. Sept. 1927. 1d.; No. 2. Sept. 1927. 1d.; No. 3. Nov. 1927. 1d.; No. 4. Dec. 1927. 1d.; No. 5. Jan. 1928. 1d.; No. 6. Feb. 1928. 1d.; No. 7. May 1928. 1d.; No. 8. May 1928. 1d.; No. 9. May 1928. 1d.; No. 10. July 1928. 1d.; No. 11. Sept. 1928. 1d.; No. 12. Nov. 1928. 1d.; No. 13. Dec. 1928. 1d.; No. 14. Jan. 1929. 1d.; No. 15. March 1929. 1d.; No. 16. April 1929. 1d.; No. 17. May 1929. 1d.; No. 18. July 1929. 1d.; No. 19. Sept. 1929. 1d.

Medical Service. Strategical and Tactical Employment of the, as carried out in an Army Corps; with a Series of Problems. Translated from the Austrian. 4s. 6d.

Medical Services. Army. Advisory Board for. The Treatment of Venereal Disease and Scabies. First Report. 1904. 1s. 6d.; Second Report. 1905. 2s.; Third Report. 1905. 1s.; Final Report. 1906. (Out of print)

Medical Services of Foreign Armies. Handbook of:—

Part I. FRANCE. 6d. Part II. GERMANY. 6d. Part III. AUSTRIA-HUNGARY. 6d. Part IV. RUSSIA. 6d. Part V. ITALY. 6d. Part VI. THE NETHERLANDS AND BELGIUM. 6d.

Mekometer Handbook. 1911. 6d.

Mesopotamia. Some Impressions of, in 1919. (1920)

Mesopotamia Campaign, 1914-18. See at end.

Military and other Terms. See SCHOOLS.

Military Cooking and Dietary. Manual of. Sept. 1924. 6d.

Military Lands Acts, 1892 to 1903. Byelaws. See ARTILLERY AND RIFLE RANGES ACT, etc.

Militia Regulations, 1911. Amendment. Order by His Majesty dated Oct. 1927. 1d.

Mine Rescue Work on the Western Front. 5s.

Mounted Troops (Divisional Training). June 1915. Provisional. 1d.

Movement Manual (War). Aug. 1923. 1s. Amendment No. 1. Jan. 1928. 1d.

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Number of Troops to the Yard in the principal battles since 1850. Memo. on. With opinions of Modern Authorities on limits of extension at the present day. 1884. 9d.

Nursing Service. Queen Alexandra's Imperial Military. Regulations for Admission to the, 1927. 1d. See also TERRITORIAL FORCE.

Officers died in the Great War, 1914-19:—

Part I. Old and New Armies } 7s. 6d.
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Regulations. 1921. Reprinted with Amendments to Jan. 1925. 1s. Amendments No. 1. Oct. 1925. 1d.; No. 4. Feb. 1926. 2d.; No. 6. Nov. 1926. 2d.; May 1927. 3d.; July 1927. 1d.; No. 1*. Dec. 1927. 1d.; No. 3. July 1928. 1d.; No. 4. Aug. 1928. 3d.; No. 5. Nov. 1928. 1d.; No. 6. Jan. 1929. 1d.; No. 7. Sept. 1929. 1d.

Special A.O. March 16, 1908. 1d.

Junior Division. Instructions for the Annual Camps. 1925. 6d. Amendment No. 1*. Oct. 1927. 1d.; No. 2. July 1928. 1d.; No. 3. Dec. 1928. 1d.; No. 4. March 1929. 1d. No. 5. May 1929. 1d.

Report on the Examination for Certificate "A" held in March 1920, for Cadets of the Junior and Senior Division. 1s.

- Optics and their Application to Service Instruments.** Elementary Notes compiled for use in the Range-finding Branch, Military College of Science, Woolwich, 1927. 3s.
- Orange Free State Topographical Survey, 1905-1911.** Report on the 10s.
- Ordnance College.** See also ARTILLERY COLLEGE:—
Advanced Classes, Reports on:—
Up to the 33rd. Each 1s.
34th. 6d.
35th. 1s.
36th and later. See ARTILLERY COLLEGE.
Artificers, Military. Handbook for. 10th Edition. 1915. 9d.
Ordnance Courses, Reports on:—
Up to the 16th. Each 1s.
17th. 9d.
18th and 19th. 1s. 6d. each.
Regulations. 1907. 2d.
Ordnance Corps. Royal Army. Standing Orders. 1922. (Provisional. 6d. Amendments, April 1924. 1d.; April 1925. 1d.; Amendments, 1926. 2d.
- Ordnance Duties.** A Course of 3 Lectures given to the Army Class London School of Economics. 1925. 1s. 9d.
- Ordnance Manual (War).** 1914. 6d.
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